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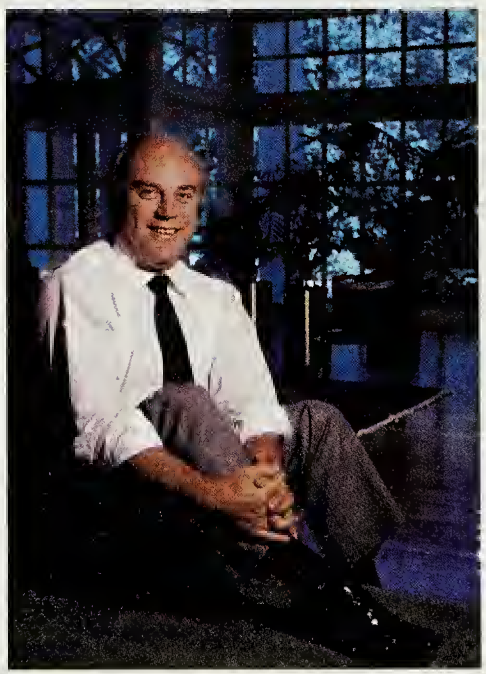

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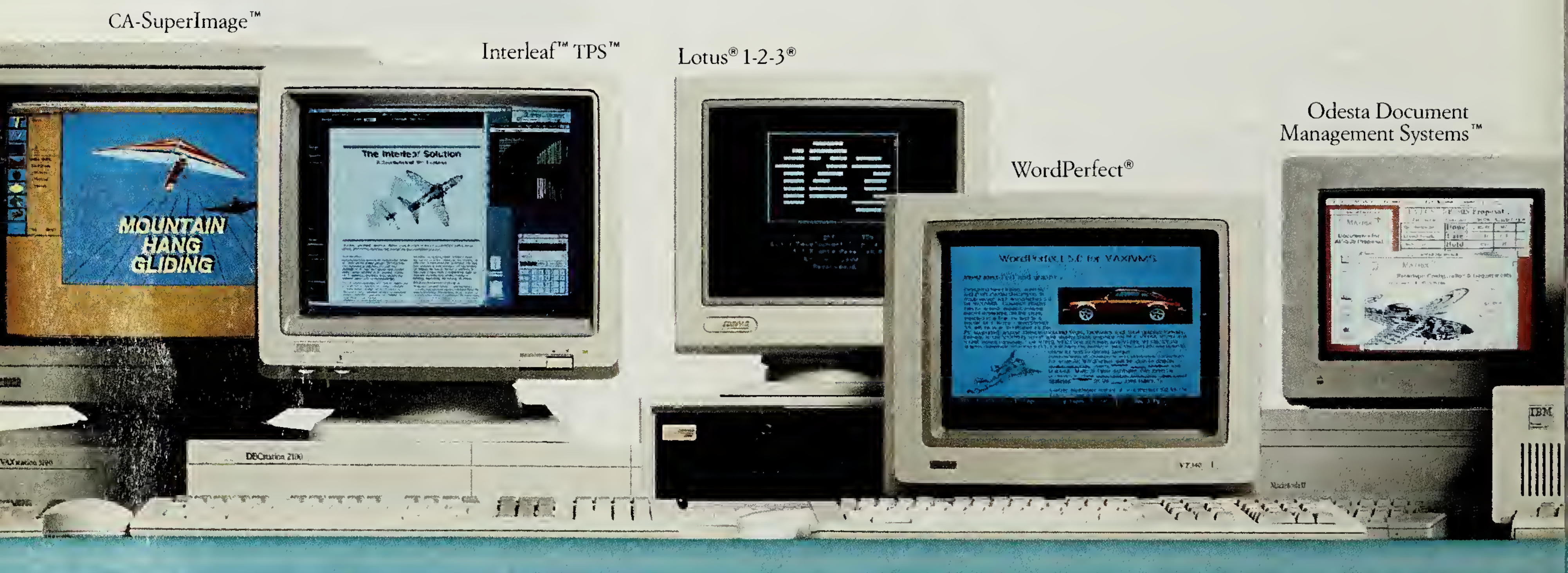

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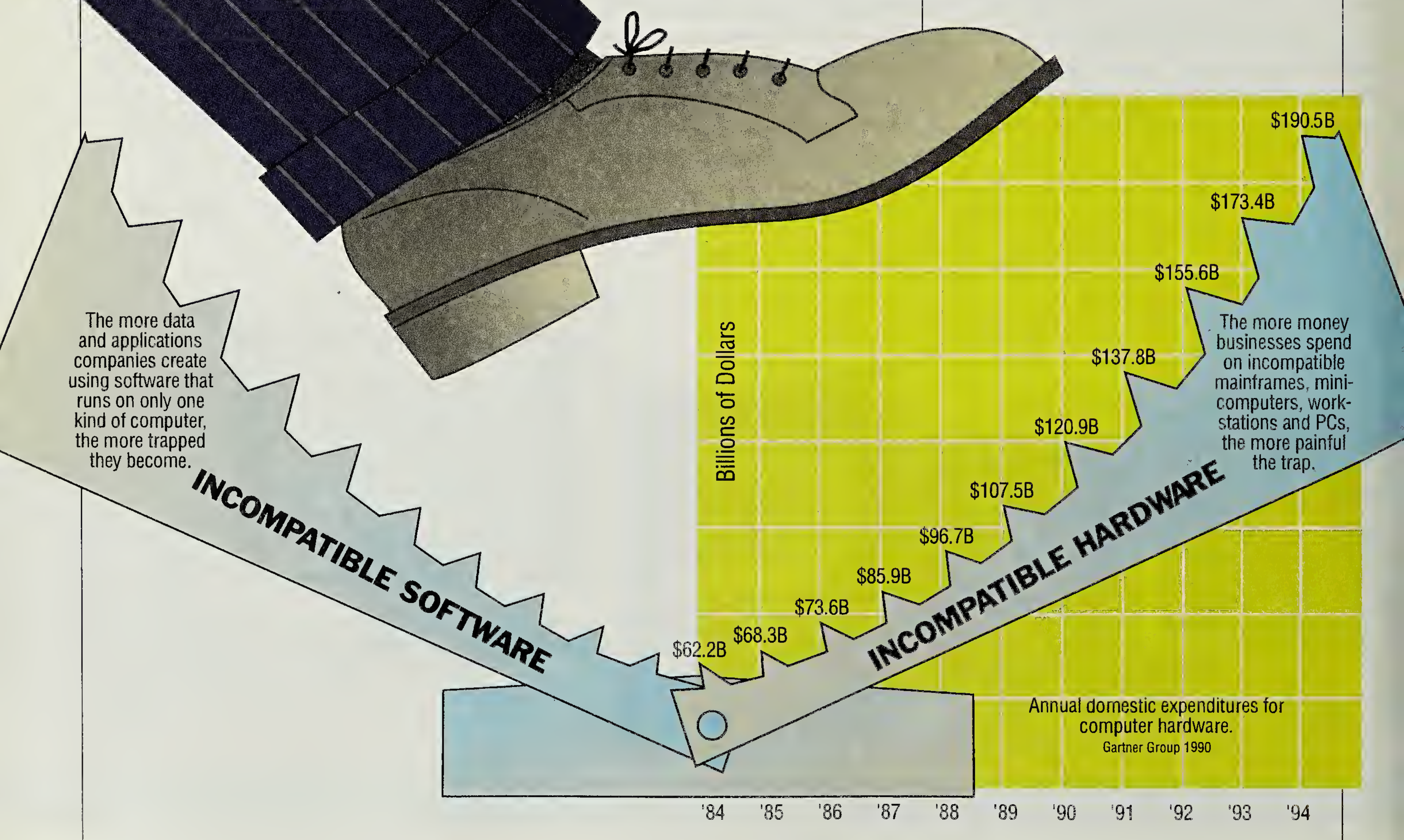

The more data and applications companies create using software that runs on only one kind of computer, the more trapped they become.

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Annual domestic expenditures for computer hardware.
Gartner Group 1990

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MORE THAN MONEY

Stephen Sherman

The 1990 Premier 100 Team: *(From left) Joseph Maglitta, Derek Slater, Nancy Kowal, Michael Sullivan-Trainor, Kelly Dwyer and Joyce Chutchian*

Money alone, nearly anyone can tell you, will not buy happiness and friends. Nor success using information technology.

It's true that a company needs to spend money on information technology often just to stay competitive. But to be considered "effective," organizations also need to *make* money over the long haul. That's why the *Computerworld Premier 100* is not simply a roster of big spenders.

Besides being tied to IS spending, our rankings are based on five other carefully selected criteria, including long- and short-term profitability. We also look at the market value of the major systems to determine whether a company is using current technology. Investments in people are as important as investments in hardware, so our ranking also includes percentages of budget for staff and training. Technology access via PCs and terminals is also vital to company effectiveness, so another ratio covers this dimension.

The *Computerworld Premier 100* is actually two lists in one: an overall ranking of IS effectiveness across all industries, and separate rankings of the Top 10 in each industry.

This ranking system is used by companies as a measure of the value of their IS organizations. Each year, we get hundreds of reprint requests from firms wondering how *they* are doing.

More than six months of research and editorial work went into this year's *Computerworld Premier 100* issue. With job hopping at the top levels of IS still common, our staff had to make thousands of calls to track down IS chiefs at 500 corporations. Hundreds of hours of intense analysis went into verifying and calculating the survey data.

We extend congratulations to the winners, appreciation to the participating companies and an invitation to see how America's best put information technology to effective use.

Joseph Maglitta

Michael Sullivan-Trainor

Michael Sullivan-Trainor
Senior Editors

Top IS Users Soar Above Tough Times

BY MICHAEL SULLIVAN-TRAINOR

AND JOSEPH MAGLITTA

Gone are the days when information systems could hide in the back office, sheltered from the turbulent winds of corporate change. As technology plays a greater role in determining company success, information systems professionals are facing the same challenges as their peers in other front-line departments.

Nothing illustrates this shift more clearly than *Computerworld*'s *1990 Premier 100* rankings. Each of the qualifying companies exemplifies the new role of IS.

Now, rather than focusing only on the latest IBM announcement, *Premier 100* executives are grappling with the various challenges of their industries. Financial services firms such as Paine Webber, Inc. are struggling with Wall Street's woes. Defense contractors such as General Dynamics Corp. are anticipating large reductions in their government business. Retailers such as Sears, Roebuck and Co. are battling reduced consumer spending. All the companies on the list are battening down for the looming recession.

However, the biggest factor that causes these companies to rise above various business booby traps is their continued commitment to IS — despite corporate performance dips and anxiety about the future. Not coincidentally, faith in IS corresponds closely to a company's ability to remain profitable despite tough times.

For example, **MCI Communications Corp.** — the only company to rank in the *Premier 100* Top 10 three years in a row — repeats its first-place ranking in 1990 with a 61% increase in profitability from 1988 to 1989 and a 40% increase in its IS budget (from $285 million to $400 million). These achievements are the products of continued victories in the organization's competitive battles with its long-distance service rivals as well as expansion and strategic alliances.

FMC Corp. rockets to second place this year with a $110 million IS budget (an increase of 10%) and significant investments in new equipment. For example, IS spending in the company's agricultural

Illustration by Robert Crawford

100
R. Crawford

chemicals group has increased 200% in the past three years. During that time, three plants were upgraded on the industrial chemicals side of the business, along with investments in computer systems for sales and marketing. At the same time, the company's profitability increased 21% from 1988 to 1989. All these events occurred at a time of aggressive competition in the chemicals industry and threatened defense cutbacks, which could affect half the company's business.

American Airlines and its parent, **AMR Corp.**, continue to wing along atop the transportation industry. The company reduced its billion-dollar IS spending by less than 1%, while maintaining its commitment to Sabre and planning a major downscaling of the massive computer reservation system. Profit for AMR was also down 5%, contributing to its slippage in rank to fourth overall.

Other companies continue to be committed to technology despite profit problems — a tribute to the IS executive's ability to support the technology program in difficult weather. **Sears** vaulted to 12th place in 1990 on the strength of a 20% budget increase and profit growth of 3.8%. Yet the $54 billion giant is struggling in 1990, and cost-reduction pressure is mounting. Nevertheless, a strong management commitment to technology continues and may help pull the company back into the limelight.

Bankers Trust New York Corp. is riding a roller-coaster earnings cycle. The volatility of South American loans made it No. 1 in profit growth in 1988 and dealt the company a loss in 1989. However, the bank's commitment to IS remains unswerving. Such support has allowed the company to build a pioneering architecture that supports global operations at a time when other companies are struggling to reach beyond their current systems to support a worldwide market.

INDUSTRY RANKINGS

Average point totals for vertical industries

Industry	Average
Transportation	26,891
Banking	26,465
Utilities	26,452
Chemicals	26,143
Aerospace	26,088
Diversified Services	25,948
Petroleum and Mining	25,913
Industrial and Automotive	25,796
Retail	25,517
Financial Services	25,486
Consumer Products	25,398
Equipment and Materials	25,292
Pharmaceuticals and Food	25,262

Overall, the *Premier 100* Top 10 increased spending by an average of 8%, or 5.4% of their total revenue, down 0.2% from last year's Top 10. Investments in current computer systems increased by an average of 6%, but the ratio to revenue actually decreased by 0.2%. Investments in personnel also decreased by an average of 5%, and training expenditures remained about even. The growth area is personal computers and terminals, which increased by an average of 12%.

As significant as the statistics are, the way that these investments are applied make the difference between *Premier 100* winners and the rest of the pack. One key ingredient to a recipe for IS effectiveness is the ability to carry out a unified vision of where technology integrates with business requirements. For the top companies, this statement is more than motherhood and apple pie: It is the way they do their jobs.

For example, MCI succeeds because its IS investments are intrinsic to the development and growth of its network — the single most important element in the company's arsenal. Savvy marketing and key strategic relationships would falter without a solid systems infrastructure to back them up.

American Airlines is likewise guided by such single-minded vision. Sabre is the focus of the company's attention, and IS is responsible for making it work and making it work well.

A unified sense of where technology should be applied and how to apply it permeates the atmosphere of IS operations at FMC, 3M Co. and Caterpillar, Inc. as well.

As important as insight into systems applications are the tools to carry out the functions. Leading-edge technologies or ways to revitalize old applications are vital to carrying out the promise of IS. All of the top companies employ current technology to get the job done. But some stand out

THIS SEASON, CORPORATIONS WANT A LEAN, MEAN IS MACHINE

Leaner, more supple and closer to the action is how firms want their IS organizations, IS executives say.

Rather than centralize or decentralize, executives report that their organizations are crafting new, hybrid structures combining both forms. In fact, a survey of companies reveals that more than half (56) are now operating "mixed" IS organizations. Another 24 retain centralized structures, while 12 are fully decentralized.

Proponents of mixed structures include the following: FMC Corp., General Dynamics Corp., Abbott Laboratories, ALCOA and Pacific Mutual Life Insurance Co. Centralization is favored by Paine Webber, Inc., The Travelers Corp. and Signet Banking Corp., to name a few. Among the larger decentralized companies are American Express Co., Gencorp, Inc. and United Technologies Corp.

According to IS managers, the new hybrid structures let organizations take advantage of local access to technology while still providing overall guidance for systems efforts from the central organization.

An important related development is the fast-growing popularity of data center consolidation as a cost-cutting measure. All told, 43 of the companies report that they have merged or consolidated data centers over the last year — thanks to better and more efficient technology. Another 27 expect to do so in the coming year.

Typical among consolidators is Edwin Sherin, senior vice-president of IS at Primerica Corp., who reports: "We will continue to implement a data center consolidation effort which will yield significant expense savings."

Ameritech reports data center consolidations from 14 to four over a five-year period.

Consolidation is especially popular among aerospace firms, which are also restructuring and downsizing in anticipation of federal defense budget cutbacks.

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- **80.** Educator, Journalists, Librarians, Students
- **90.** Others ________ (Please specify)

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more than others.

Merck and Co.'s Albert Cinorre, vice-president of computer resources, oversees an IS budget of $185 million. Traditionally a major Wang Laboratories, Inc. shop, Merck has turned to the latest IBM systems to speed drug development, particularly in the area of molecular modeling.

Such investments in the latest systems must be tempered today with a keen awareness of budget contraints. Cost efficiency is a major theme among the most effective users of IS. At **FMC**, for example, no processor is bought before its time. The systems are purchased at the beginning of their cycle below peak costs and are jettisoned before their value expires. But more than that, the latest 3090 or direct-access storage device will not cross the threshold of the organization's computer center without a proven business requirement for the system.

HIGHEST TRAINING RATIOS

Percentage of IS budget spent on training

Corporation	Percent
3M Co.	7.2
FMC Corp.	7.0
The Travelers Corp.	7.0
Union Carbide	7.0
MCI Communications Corp.	6.0
Merck and Co.	6.0
Becton, Dickinson and Co.	5.4
Northeast Utilities	5.2
Sears, Roebuck and Co.	5.2

The IS group at **Caterpillar** is also adamant that technology usage match business requirements. This emphasis coincides with a management direction that ties investments to the total business rather than a single task. For example, Caterpillar is engaged in a five-year project called "Plant With a Future" that will revamp the company's 32 facilities worldwide by 1992 through the use of the latest systems.

Other companies emphasize process and integration with the company culture as subtler ways to fashion effective IS organizations. **General Dynamics** focuses on total quality management, where less than 100% quality is unacceptable. Such concentration speeds application development by involving more user participation and embeds the philosophy of doing it right the first time into the organization's culture.

Likewise, 3M is a company that lives by innovating. Its manufacturing process is marked by continual enhancement and reinvention of its products. IS at 3M is the life-support system, making innovation possible through speeding idea development to later process stages and using standards to guarantee uniformity throughout the world.

Last but still key is an emphasis on the people who run the IS operations. Companies such as **Paine Webber** and **Union Texas Petroleum Holdings, Inc.** empower those involved in IS — both users and technical specialists — by giving them control over their work and exposure to both technical and business requirements. In fact, Paine Webber recently fired 71 outside consultants and entrusted their projects to internal staff to cut costs and to show faith in the staff at the same time.

SPENDING HIGHS AND LOWS

Largest IS budget

Corporation	1990 IS Budget (millions)	Overall rank
AMR Corp.	1,214	4
Boeing Co.	1,164	49
Sears, Roebuck and Co.	990	12
Ameritech Applied Technology	880	23
American Express Co.*	874	26

Smallest IS budget

Corporation	1990 IS Budget (millions)	Overall rank
Louisiana Land & Exploration Co.*	7	86
The Penn Central Corp.*	15	75
Jostens, Inc.*	16	100
Freeport-McMoran, Inc.	17	70
Union Texas Petroleum Holdings, Inc.	18	5

*Budgets are based on *Computerworld* estimates.

The *Premier 100* also tells the story of companies that, despite strong efforts, find it difficult to keep up with the highfliers in the choppy IS stratosphere. Though they are still effective IS operations, the companies are finding that business circumstances are taking their toll. Among these are **Baxter International, Inc.**, which fell from the lofty position of eighth overall and No. 1 in manufacturing last year to 50th this year because of significant downsizing and restructuring, leading to a $50 million reduction in the IS budget. Michael Heschel, Baxter's well-known IS chief, moved over to head IS at Security Pacific Corp.

BIGGEST PC USERS

Top 10 PC to employee ratios

Corporation	PCs: employee
The Mutual Life Insurance Co. of New York	1.58 : 1
MCI Communications Corp.	1.55 : 1
US West	1.50 : 1
AMR Corp.	1.29 : 1
Bankamerica Corp.	1.29 : 1
Signet Banking Corp.	1.25 : 1
Louisiana Land and Exploration Co.	1.21 : 1
The Travelers Corp.	1.15 : 1
Oryx Energy Co.	1.10 : 1
Union Texas Petroleum Holding Co.	.95 : 1

Modest increases in spending and profit at **Dow Chemical Co.**, another industry winner last year, caused it to be passed by other fast-rising companies. The company relocated five spots lower on the list, with continued data center consolidations as the major activity.

Lockheed Corp. toppled down on the list because of a large reduction in profit accompanied by changes caused by a restructuring of the aeronautical group, shutting down operations in California and consolidating in Georgia.

Northrop Corp. also fell lower on the list with a 23% budget cut as part of consolidations and streamlining. This cut was accompanied by a large drop in profits.

Other companies, such as **Northeast Utilities**, which captured the top rank overall in 1988, simply failed to keep up with the pack. Modest budget and value increases of less than 2% and personal computer and terminals boosts of less than 10% coupled with a 10% profit drop caused the company to fall further down the list.

All the ups and downs of life at the top of IS evidenced by the *Computerworld Premier 100* show the battle scars of the 1990s. And to think it's only the beginning of the decade. ☐

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The
PREMIER 100
Survey:

HIGH PRESSURE, HIGH STAKES

BY MICHAEL SULLIVAN-TRAINOR
AND JOSEPH MAGLITTA

More pressure. More money. More business focus. The new reality is unmistakable: Information technology has become a much higher-stakes game.

Top information systems executives say their companies are counting on information technology more than ever to shore up and even expand their businesses. Any doubts about the passing of the sheltered, glass-house days of data processing are dead as an IBM 360. To be in IS today means to be in business. Big business.

That's the clear message from the first-ever poll of *Computerworld Premier 100* firms. The telephone survey was conducted by First Market Research in Boston, between Aug. 27 and Sept. 12. Respondents were 92 top information executives in *Premier 100* companies.

Of course, life in a faster lane has its pluses: Despite a choking national economy, most IS managers say their budgets have *increased* this year. Nearly six in 10 got hikes that averaged a healthy 17.2% for 1990.

"[IS spending] is like a wheel," says William Friel, an executive vice-president at The Prudential Insurance Co. "We are consistently driving down the unit cost of computing, but we are investing more to deliver more applications supporting the business thrust."

Q **During the past year, do you believe that the degree of scrutiny by top management and shareholders has increased, decreased or stayed about the same?**

A

Increased	70
Stayed the same	21
Decreased	0

Number of respondents (Base: 91)

Only about one in 10 IS budgets took a cut. The average decrease was 15.8%.

The extra cash comes at a price, however. Companies sinking more money into information technology want more payback for their dollar. The result is that IS managers are feeling more top managers breathing down their necks. Nearly three-quarters say they are more closely scrutinized by top management and stockholders than they were a year ago.

"We have had moderate budget increases, but every increase is tied to specific projects that are expected to save the company big bucks," says Alfred Caponiti, director of data and database administration at Bell Atlantic Corp.

This reality, among others, has led three-quarters of the respondents to set up programs to measure the value or effectiveness of information technology. Results, however, have been mixed: More than half rated their program only "somewhat successful."

With more responsibility also comes more worry, executives say. What keeps top IS managers awake at 3 a.m.? Increasingly, it's the same

Q **In your opinion, what will be the biggest challenges facing your IS department in the coming year?**

A

Top four answers	
Improving products and services and keeping costs down	30
Implementing new systems and staying current with technology	25
Integration of systems and data	15
Finding qualified people and developing skills	7

Number of respondents (Base: 92)

issues that keep their business counterparts awake: the need to make profitable, competitive products; handling technological change and integration; worldwide recession; and disenchanted customers.

"Because of the competitiveness within the banking industry, everyone is taking a tighter look at the bottom line," says Bob Sevacko, manager of data center operations at Wells Fargo and Co.

Predictably, most IS executives in every industry say they expect competition to get tougher during the next year.

Many IS executives' worlds are also getting bigger — and fast. Nearly half say their IS organizations expanded abroad or began offering systems support outside the U.S. during the past year. Their confidence level is high; the majority think U.S. companies are more effective users of information technology than Japanese or European firms, especially the latter.

Yet despite a new, strong business focus, IS executives haven't forgotten that their big weapon is still technology. Imaging systems in particular are seen as having the "most critical" value for competitive success during the next five years, followed closely by local-area networks and computer-aided software engineering (CASE) tools. Interestingly, media darlings such as workstations, distributed processing and Integrated Services Digital Network ranked at the bottom of the list.

Faith in technology remains high. A full 98% say that advanced or leading-edge technology is critical or important to their competitive survival. "Local and long-distance telephone services are extremely competitive now," says Derek Bailey, manager of systems and operations at United Telecommunications. "Without the advantage in clarity that our fiber-optic technology gives us, we would not be able to compete."

Q **How important is advanced or leading-edge technology to staying competitive in your industry?**

A

Critical	24
Very important	47
Somewhat important	20
Not very important	1

Number of respondents (Base: 92)

Indeed, the idea of using information technology to get a leg up on the competition is far from dead. During the last 12 months, two-thirds of the respondents installed an information system with the express purpose of providing competitive advantage.

REDESIGN TREND

Premier 100 companies are not merely throwing dollars at technology, though. Most recognize a clear need to fundamentally change the way they do business. To this end, a whopping four-fifths say they have redesigned or re-engineered a key business process to take advantage of information technology. The trend is expected to continue.

Nearly three-quarters have looked into outsourcing. Half say they will outsource all or part of their operations within the next 12 months.

For example, the refining and marketing branch at Sun Co. has signed a letter of intent to outsource its data operations. "We are getting rid of surplus computing power and building space. The end result is significant savings," says Edward Parrish, director of IS.

Q **What is the single biggest challenge now facing your industry?**

A

Top four answers

Technological change and integration	21
Providing profitable and competitive products	20
Expense control and low-cost production	10
Worldwide recession and global situation	7

Number of respondents (Base: 92)

In the executives' own companies, sales and marketing are hot spots demanding attention, followed by manufacturing and customer service.

Faced with both technical and business challenges, how do top IS managers plan to survive the next few years? Most executives say good technology planning and integration are key. Also required, they say, is a strong top management buy-in and extra attention to staffing and training.

"The people you hire are extremely important," says Karen French, manager of programming at Ingersoll-Rand Corp. "Without strong commitment from management, we take a few steps backward and become a file server-type operation, instead of an integrated part of business planning."

Q **Has your company's IS budget increased, decreased or stayed the same during the past year?**

A

Increased	53
Stayed the same	21
Decreased	15

Number of respondents (Base: 89)

Their advice for rising IS stars? Besides learning the business, IS executives say to focus on keeping technically current and acquiring good people skills.

In the long term, some IS executives foresee that the blurring between technology and business will eventually extend deeper into company ranks.

"If you look at the decade ahead — especially the end of the decade — I think it will become very difficult to distinguish the programmer from the business person," says Jim Gottardi, manager of IS at Phillips Petroleum.

"The distinction we see today will blur. CASE technology, for example, may ultimately allow a fairly nontechnical person with limited [or no] knowledge of programming languages to develop a working application," he says. ☐

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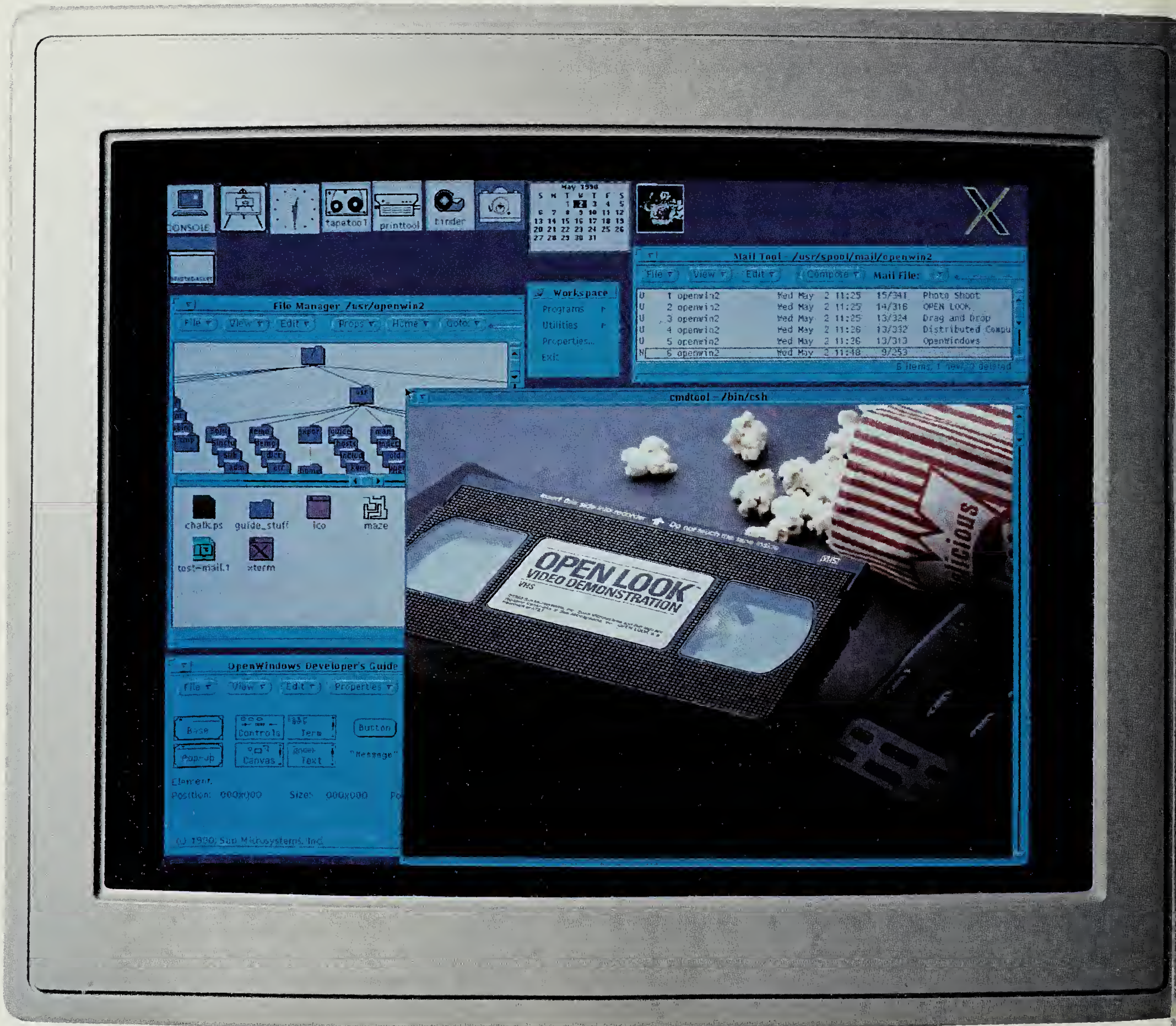

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U    1 openwin2        Wed May  2 11:25   15/341   Photo Shoot
U    2 openwin2        Wed May  2 11:25   14/316   OPEN LOOK
U    3 openwin2        Wed May  2 11:25   13/324   Drag and Drop
U    4 openwin2        Wed May  2 11:26   13/332   Distributed Compu
U    5 openwin2        Wed May  2 11:26   13/313   OpenWindows
N    6 openwin2        Wed May  2 11:48    9/253
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GUIDE TO TABLES

HOW WE RANK THE PREMIER 100

TARGET GROUP

To qualify for Computerworld's Premier 100, a company must be publicly traded, U.S.-based and in the top half of its vertical industry group as listed in the annual "Fortune Industrial 500" or "Fortune Service 500". Only parent companies are ranked; subsidiaries are considered under parent company affiliations. Firms that make the majority of their revenue from the sale of information systems and related products are not included in the ranking.

DATA GATHERING

Premier 100 companies are ranked based on data gathered in an extensive survey that involves mail surveys followed by telephone interviews. Data is collected from the chief information systems executive in the organization. In a limited number of cases where the company does not supply data, Computerworld generates estimates based on market research and other sources. All estimates are confirmed prior to rank calculation.

RANK CALCULATION

Overall scores are based on the sum of point totals of six criteria: 1) IS budget 2) five-year profit average 3) current market value of major processors 4) percentage of budget spent on staff 5) percentage of budget spent on training and 6) ratio of personal computers and terminals to total employees. Each criterion is calculated separately for all firms in the target group. Point totals, which are weighted according to their relative importance, are then combined, yielding a final score.

IS BUDGET

The IS budget is measured as a percentage of total revenue. This levels the field, so that the largest firms, which are able to invest significantly more in IS, do not dominate the ranking.

To account for differences in spending levels between industries, a company's budget/revenue percentage is then compared with the average for IS spending as a percentage of revenue for that company's industry.

For example, a bank's percentage is compared with an industry average spending percentage of more than 4%, while a retailer's percentage is compared with an average percentage of 1%. The firms that achieve the greatest difference between their percentage and the average for their industry receive the most points. This is weighted by a factor of 30.

PROFIT AVERAGE

The ranking employs a rolling, five-year profit average. In the 1990 edition, profits for '85,'86,'87,'88 and '89 were considered. The companies with the largest average growth in profits received the most points, weighted by a factor of 15.

PROCESSOR VALUE

The value of major processors, specifically mainframes and minicomputers, is calculated based on what the systems would be worth if they were sold on the market today. This figure is then divided by total revenue so that large firms do not automatically gain more points. The percentage of value to revenue is weighted by a factor of 15.

STAFF AND TRAINING

Calculations for staff and training are based on amounts for those items compared with the IS budget. Fewer points are given for a larger percentage spent on staff. More points are given for a larger percentage spent on training. Points for staff percentages are weighted by a factor of 10. Training points are weighted by a factor of 15.

PCS AND TERMINALS

The total numbers of PCs and terminals are added together and then divided by the total number of employees to obtain this ratio. Points for the ratio are weighted by a factor of 15.

DEFINITIONS

CHART TYPES

Following this page is the main chart listing data for those companies that qualified for the Top 100 ranking. Each vertical industry section also contains a chart that lists data for the Top 10 companies in specific industries, regardless of whether they qualified for the Top 100.

IS BUDGET

Figures represent 1990 totals for corporatewide capital and operating budgets for information systems and services. Expenditures for staff, hardware, software and data communications are included. Not included are telecommunications costs or spending on information technology by departments other than IS.

1989 PROFIT

Profits used in the ranking are after taxes and after extraordinary credits or charges. Profit for mutual insurance companies is based on net gain from operations, and revenue is based on premium and annuity income plus net investment income.

MARKET VALUE

Figures are totals for the current market value for all major processors, including supercomputers, mainframes and minicomputers. They reflect the dollar value of the systems if they were sold on the market today, regardless of whether the company owns or leases the systems.

OTHER STATISTICS

Training figures include in-house and off-site costs. Staff figures include salary, benefits and travel. The total number of personal computers and terminals include brokerage systems, travel agent systems and retailing systems in all user departments and IS. Revenue for banks includes interest income plus other operating income.

OOTNOTES

+ on the main chart indicates the following: Bankers Trust — reflects accounting for a loss in Latin American loan reserves; Bell Atlantic — reflects extraordinary charges of 75.7 million for a change in accounting method and $244.8 million for restructuring and other charges; FMC Corp. and Carter Hawley Hale Stores, Inc. — reflects extraordinary arges of at least 10%.

The 100 Most Effective Users of Information Systems

Overall rank	1989 rank	**Company** IS executive	**Industry**	**Industry rank**	**Total score**	**IS budget** (millions)
1	1	**MCI Communications Corp.** Allan Ditchfield, Senior VP	utilities	1	28,530	$400
2	---	**FMC Corp.*** Dan W. Irwin, VP	chemicals	1	28,450	$110
3	4	**Bankers Trust New York Corp.** Carmine Vona, Executive VP	banking	1	28,200	$400
4	3	**AMR Corp.** Max D. Hopper, Senior VP	transportation	1	28,100	$1,214
5	19	**Union Texas Petroleum Holdings, Inc.** Richard L. White, Director	petroleum	1	27,905	$18
6	6	**General Dynamics Corp.** Asaph H. Hall, VP	aerospace	1	27,855	$585
7	48	**Paine Webber, Inc.*** Robert McKinney, CIO	financial services	1	27,755	$200
8	15	**Norwest Corp.** Brian Phillips, Executive VP	banking	2	27,710	$133
9	5	**Banc One Corp.** Dave Van Lear, President, Services Corp.	banking	3	27,565	$235
10	13	**Gencorp, Inc.*** Linda George, Director	aerospace	2	27,525	$40
11	44	**The Dun & Bradstreet Corp.** Michael S. Field, President, IS	diversified services	1	27,465	$750
12	---	**Sears, Roebuck and Co.** Charles A. Carlson, President, Technology Services	retailing	1	27,390	$990
13	10	**Gillette Co.*** Herbert W. Moller, VP	consumer products	1	27,375	$112
14	---	**Chicago & North Western Transportation Co.*** Ed Lillig, VP	transportation	2	27,250	$42
15	74	**Signet Banking Corp.** Floyd Griggs, Executive VP	banking	4	27,210	$57
16	93	**Martin Marietta Corp.** Raymond S. Wiltshire, VP	aerospace	3	27,150	$291
17	7	**Security Pacific Corp.** Mike Heschel, Chairman and CEO, Automation Co.	banking	5	27,105	$431
18	---	**United Telecommunications, Inc.*** Art Krause, Executive VP	utilities	2	27,060	$138
19	---	**Corestates Financial Corp.** Robert Gilmore, Executive VP	banking	6	27,055	$71
20	16	**The Dow Chemical Co.** Dave Butler, Director	chemicals	2	27,050	$347
21	2	**GTE Corp.*** Joseph Rasmussen, Director	utilities	3	27,000	$750
22	14	**Bell Atlantic Corp.** Joe Ambrozy, VP	utilities	4	26,930	$709
23	---	**Ameritech Applied Technologies** Henry Kozik, Manager	utilities	5	26,895	$880
24	---	**Allied-Signal, Inc.*** Donald Fleming, Director	aerospace	4	26,880	$372
25	---	**Air Products and Chemicals, Inc.** Peter Mather, VP	chemicals	3	26,685	$46
Medians for all Premier 100 companies					25,635	$158

* Estimates are from *Computerworld* sources, not the company ++See footnotes, page 17

IS budget as % of revenue	Processor market value (millions)	Market value as % of revenue	Total IS staff	% of IS budget for staff	% of IS budget for training	Total PCs and terminals	PCs/terminals: employees	'89 profit (millions)
6.15%	$226	3.48%	1,700	43%	6%	29,500	1.55 : 1	$529
3.18%	$35	1.01%	NA	37%	7%	7,200	.74 : 1	$136
5.48%	$75	1.03%	1,535	37%	1%	9,000	.65 : 1	$(980)[++]
11.46%	$97	0.92%	4,000	26%	1%	124,000	1.29 : 1	$455
1.55%	$18	1.55%	96	44%	1%	1,800	.95 : 1	$173
5.82%	$250	2.49%	5,950	42%	2%	28,000	.29 : 1	$293
6.84%	$12	0.41%	NA	49%	2%	10,357	.80 : 1	$139
4.54%	$49	1.67%	890	32%	2%	15,500	.84 : 1	$237
7.34%	$40	1.25%	1,100	30%	5%	14,000	.58 : 1	$363
2%	$15	0.75%	NA	36%	5%	8,700	.58 : 1	$210
17%	$150	3.47%	12,000	45%	3%	50,000	.71 : 1	$586
1.84%	$613	1.14%	6,500	39%	5%	332,350	.75 : 1	$1,509
2.93%	$85	2.23%	NA	50%	5%	8,500	.28 : 1	$285
4.34%	$11	1.09%	NA	39%	2%	4,590	.61 : 1	$(21)
4.18%	$18	1.31%	683	43%	3%	7,107	1.25 : 1	$123
5.02%	$62	1.07%	2,505	35%	2%	20,100	.44 : 1	$307
4.3%	$125	1.25%	6,500	46%	1%	31,000	.75 : 1	$741
1.83%	$75	0.99%	NA	39%	4%	38,636	.93 : 1	$363
5.26%	$17	1.26%	710	43%	1%	10,000	.83 : 1	$240
1.97%	$100	0.57%	1,900	34%	5%	32,000	.52 : 1	$2,486
4.3%	$140	0.8%	NA	37%	5%	90,000	.57 : 1	$1,417
6.19%	$416	3.63%	3,400	34%	4%	66,000	.83 : 1	$1,070[++]
8.62%	$115	1.13%	4,700	45%	4%	65,000	.86 : 1	$1,238
3.09%	$159	1.32%	NA	47%	3%	33,543	.31 : 1	$528
2.29%	$5	0.24%	368	42%	1%	5,180	.49 : 1	$289
2.71%	$45.5	0.93%	1,800	41%	3%	13,735	.55 : 1	$289

The 100 Most Effective Users of Information Systems

Overall rank	1989 rank	**Company** IS executive	**Industry**	**Industry rank**	**Total score**	**IS budget** (millions)
26	25	**American Express Co.** Ray Lawrence, VP, Corporate	financial services	2	26,675	$874
27	30	**US West** Winston Wade, VP	utilities	6	26,645	$263
28	46	**Federal Express Corp.** Ron Ponder, Senior VP	transportation	3	26,625	$234
29	21	**Southwestern Bell Corp.** Donald A. Reeb, Manager	utilities	7	26,610	$294
30	24	**3M Co.** Donald Siegfried, Executive Director	manufacturing	1	26,540	$469
31	33	**Atlantic Richfield Co.** John Caman, Manager	petroleum	2	26,465	$237
32	---	**Oryx Energy Co.** W.M. Fare, Director	petroleum	3	26,455	$27
33	---	**Phillips Petroleum Co.** P.J. Gattardi, Manager	petroleum	4	26,440	$160
34	---	**Pacific Mutual Life Insurance Co.*** William A. Roberts, VP	financial services	3	26,420	$57
35	69	**Caterpillar, Inc.** Dale Fieldcamp, Director	industrial	1	26,405	$300
36	---	**Salomon, Inc.*** John Galante, VP	financial services	4	26,395	$335
37	32	**Monsanto Co.** Leonard A. Cahn, VP	chemicals	4	26,365	$190
38	57	**Merck & Co.** Albert C. Cinorre, VP	pharmaceuticals	1	26,310	$185
39	9	**Contel Corp.*** Chuck Achuff, Acting Director	utilities	8	26,305	$150
40	---	**Bankamerica Corp.** Martin Stein, Executive VP	banking	7	26,300	$497
41	20	**Grumman Corp.** Daniel Larkin, VP	aerospace	5	26,055	$241
42	31	**Polaroid Corp.** Al Hyland, Director	consumer products	2	26,015	$62
43	17	**The Timken Co.*** Neil Siebenhar, Director	industrial	2	25,910	$37
44	---	**General Re Corp.*** Steve Raye, VP	financial services	5	25,855	$87
45	28	**Northeast Utilities** Tad O. Dixon, VP	utilities	9	25,835	$73
46	---	**The B.F. Goodrich Co.*** Matthew J. Battista, VP	chemicals	5	25,805	$53
47	---	**Centerior Energy Corp.** Joseph Stricker, Director	utilities	10	25,755	$30
48	58	**The Mead Corp.*** John Langenbahn, VP	manufacturing	2	25,725	$53
49	67	**The Boeing Co.** Donna Mikov, President, Computer Services	aerospace	6	25,715	$1,164
50	8	**Baxter International, Inc.** Bob Kretz, VP	manufacturing	3	25,645	$200

* Estimates are from *Computerworld* sources, not the company

IS budget as % of revenue	Processor market value (millions)	Market value as % of revenue	Total IS staff	% of IS budget for staff	% of IS budget for training	Total PCs and terminals	PCs/terminals: employees	'89 profit (millions)
3.49%	$436	1.74%	7,000	23%	5%	70,000	.67 : 1	$1,157
2.71%	$288	2.97%	4,500	52%	5%	105,000	1.50 : 1	$1,111
3.34%	$74	1.06%	2,008	46%	2%	30,000	.34 : 1	$413
3.36%	$257	2.94%	2,900	54%	1%	61,700	.93 : 1	$1,093
3.72%	$167	1.33%	2,726	48%	7%	42,200	.49 : 1	$1,310
1.41%	$40	0.24%	1,500	50%	2%	15,000	.55 : 1	$1,953
2.23%	$16	1.33%	122	33%	3%	3,200	1.10 : 1	$124
1.28%	$35	0.28%	1,182	45%	3%	13,470	.60 : 1	$219
2.88%	$19	0.96%	NA	47%	2%	1,900	.55 : 1	$28
2.7%	$200	1.8%	2,500	40%	5%	25,000	.41 : 1	$497
3.72%	$33	0.37%	NA	26%	1%	6,105	.69 : 1	$470
2.19%	$142	1.63%	1,200	38%	4%	15,000	.36 : 1	$679
2.8%	$110	1.67%	1,000	50%	6%	11,000	.32 : 1	$1,500
4.81%	$25	0.8%	NA	38%	5%	5,000	.23 : 1	$287
4.36%	$132	1.16%	5,000	52%	2%	73,000	1.29 : 1	$1,103
6.69%	$69	1.92%	2,100	44%	3%	16,200	.58 : 1	$67
3.27%	$35	1.84%	475	40%	2%	5,000	.45 : 1	$145
2.41%	$19	1.24%	NA	35%	5%	5,110	.30 : 1	$55
3.14%	$11	0.38%	NA	43%	4%	1,920	.81 : 1	$599
3.3%	$117	5.3%	456	38%	5%	5,033	.60 : 1	$203
2.11%	$8	0.32%	NA	42%	4%	4,959	.42 : 1	$172
1.29%	$22	0.95%	276	40%	1%	4,952	.55 : 1	$277
1.14%	$25	0.54%	NA	61%	5%	18,273	.84 : 1	$216
5.74%	$160	0.79%	8,788	53%	2%	91,964	.56 : 1	$675
2.7%	$65	0.88%	1,100	30%	1%	25,000	.42 : 1	$446

The 100 Most Effective Users of Information Systems

Overall rank	1989 rank	**Company** IS executive	Industry	Industry rank	Total score	IS budget (millions)
51	12	**Northrop Corp.** W. Richard Howard, VP	aerospace	7	25,625	$290
52	---	**Rohm & Haas Co.*** William H. Groetzinger, Director	chemicals	6	25,620	$53
53	---	**Massachusetts Mutual Life Insurance Co.** Susan Magee, Senior VP	financial services	6	25,615	$75
54	---	**New York Life Insurance Co.** Thomas Pettibone, Senior VP	financial services	7	25,600	$156
55	---	**CSX Corp.** Jack Cooper, President, CSX Technology	transportation	4	25,590	$220
56	---	**Wells Fargo & Co.*** Elizabeth Evans, Director	banking	8	25,575	$206
57	---	**The Prudential Insurance Co. of America** William D. Friel, Executive VP	financial services	8	25,550	$818
58	---	**Primerica Corp.** Ed Sherin, Senior VP	financial services	9	25,480	$183
59	34	**United Technologies Corp.** John Hammit, VP	aerospace	8	25,475	$847
60	---	**The Pittston Co.*** Leon Selfe, Manager	industrial	3	25,470	$66
61	56	**Ingersoll-Rand Co.** George Tabback, Manager	industrial	4	25,400	$80
62	---	**Union Carbide Corp.** Ted Smith, Manager	chemicals	7	25,380	$700
63	---	**Metropolitan Life Insurance Co.** Daniel Cavanaugh, Senior VP	financial services	10	25,320	$433
64	---	**TRW, Inc.*** Don Logan, VP	manufacturing	4	25,315	$85
65	29	**McDonnell Douglas Corp.** Ernie Ridenhour, VP	aerospace	9	25,310	$755
66	38	**Textron, Inc.** Cecil Labhart, VP	aerospace	10	25,285	$252
67	---	**Quantum Chemical Corp.*** John Stooky, VP	chemicals	8	25,245	$69
68	60	**Mobil Corp.** Peter VanZyl, General Manager	petroleum	5	25,180	$740
69	42	**Rockwell International Corp.** J.F. Sutter, VP	aerospace	11	25,170	$492
70	77	**Freeport-McMoran, Inc.** Ron Landry, Director	petroleum	6	25,150	$17
71	---	**The Travelers Corp.** Lawrence A. Bacon, Senior VP	financial services	11	25,140	$342
72	36	**McGraw-Hill, Inc.*** John Dobilas, Senior VP	consumer products	3	25,135	$132
73	---	**Amax, Inc.** Joseph Rosio, Director	manufacturing	5	25,055	$30
74	23	**AT&T*** W.F. Osl, VP	utilities	11	25,040	$637
75	---	**The Penn Central Corp.*** John McDonald, Manager	manufacturing	6	25,035	$15

* Estimates are from *Computerworld* sources, not the company

IS budget as % of revenue	Processor market value (millions)	Market value as % of revenue	Total IS staff	% of IS budget for staff	% of IS budget for training	Total PCs and terminals	PCs/terminals: employees	'89 profit (millions)
5.53%	$125	2.38%	2,600	45%	5%	22,500	.59 : 1	$(81)
2%	$31	1.16%	NA	47%	2%	12,063	.92 : 1	$176
1.5%	$19	0.38%	935	61%	2%	6,000	.60 : 1	$124
1.02%	$131	0.86%	1,100	35%	2%	10,000	.55 : 1	$1,452
4.15%	$81	1.53%	1,003	39%	.05%	12,328	.31 : 1	$770
3.65%	$30	0.53%	NA	43%	3%	16,663	.85 : 1	$601
1.9%	$125	0.29%	6,425	47%	1%	65,200	.65 : 1	$743
3.22%	$24	0.42%	1,015	42%	3%	15,625	.65 : 1	$289
4.28%	$92	0.47%	4,260	46%	1%	35,918	.19 : 1	$701
4.04%	$11	0.65%	NA	39%	2%	4,914	.34 : 1	$4
2.32%	$30	0.87%	800	35%	1%	18,000	.57 : 1	$210
8.01%	$64	0.73%	500	35%	7%	5,000	.11 : 1	$1,269
1.92%	$41	0.18%	2,840	34%	2%	35,882	.72 : 1	$300
1.15%	$70	0.94%	NA	40%	5%	40,607	.55 : 1	$263
5.17%	$245	1.68%	5,600	47%	3%	70,000	.55 : 1	$219
3.39%	$61	0.82%	1,800	40%	1%	24,000	.44 : 1	$259
2.62%	$21	0.8%	NA	42%	4%	5,538	.55 : 1	$247
1.32%	$180	0.32%	3,800	34%	2%	40,000	.59 : 1	$1,800
3.94%	$180	1.44%	2,867	32%	4%	45,000	.41 : 1	$735
0.86%	$10	0.51%	115	25%	4%	1,000	.27 : 1	$150
1.8%	$114	0.6%	3,230	39%	7%	40,285	1.15 : 1	$455
7.38%	$75	4.19%	NA	41%	3%	6,824	.47 : 1	$48
0.77%	$8	0.19%	275	40%	1%	10,000	.50 : 1	$360
1.75%	$400	1.1%	NA	37%	5%	94,555	.33 : 1	$2,697
0.82%	$10	0.55%	NA	43%	3%	6,538	.43 : 1	$174

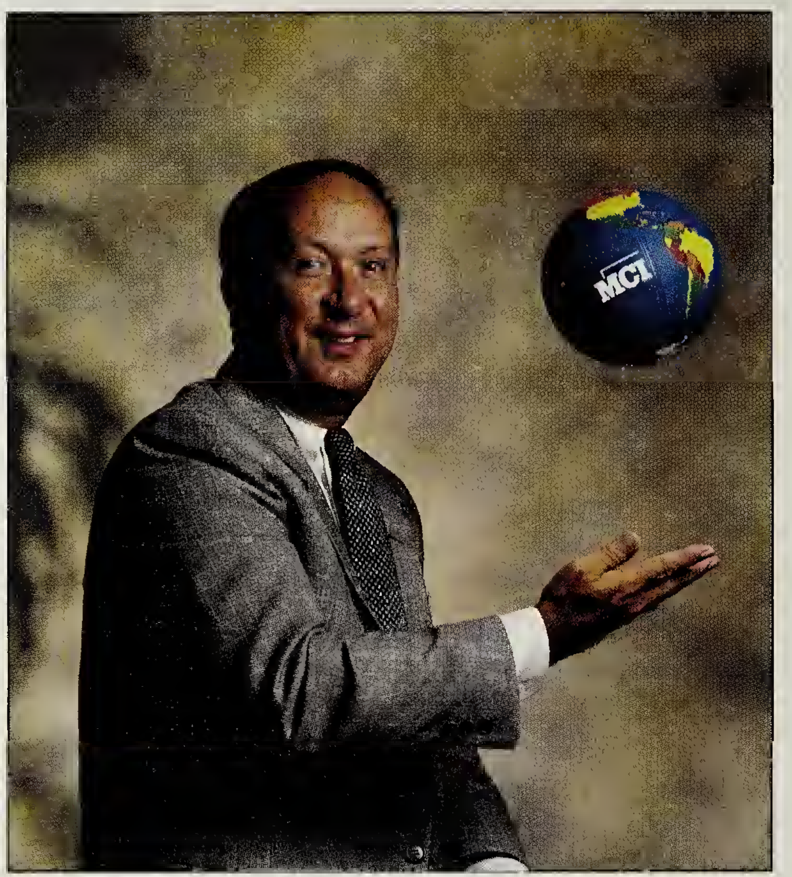
The 100 Most Effective Users of Information Systems

Overall rank	1989 rank	Company IS executive	Industry	Industry rank	Total score	IS budget (millions)
76	68	**J.P. Morgan & Co., Inc.** Ralph Mostrangelo, Senior VP	banking	9	25,030	$382
77	18	**Lockheed Corp.** Dean Allen, VP	aerospace	12	25,005	$425
78	---	**Sun Co.** Edward Parrish, Director	petroleum	7	24,980	$80
79	22	**Abbott Laboratories** Kenneth Farmer, VP	pharmaceuticals	2	24,975	$145
80	---	**Ambase Corp.*** Anthony Graffeo, Senior VP	financial services	12	24,965	$94
81	81	**National City Corp.*** Harold B. Todd, Executive VP	banking	10	24,935	$104
82	94	**Duke Power Co.** George Stubbins, VP	utilities	12	24,820	$72
83	54	**Becton, Dickinson & Co.** Hank Willin, Director	manufacturing	7	24,785	$46
84	---	**Mutual Benefit Life Insurance Co.*** Charles McCaig, Senior VP	financial services	13	24,765	$48
85	---	**Xerox Corp.** Patricio C. Barron, VP	manufacturing	8	24,740	$400
86	---	**Louisiana Land & Exploration Co.*** Nick Wood, Director	petroleum	8	24,735	$7
87	---	**Carter Hawley Hale Stores, Inc.*** Paul Burrows, VP	retailing	2	24,725	$42
88	---	**Colgate-Palmolive Co.*** Bruce Johnson, VP	consumer products	4	24,715	$77
89	---	**Aluminum Co. of America*** W.G. Nichols, Director	manufacturing	9	24,705	$104
90	---	**Valhi, Inc.*** Michael A. Snetzer, President	chemicals	9	24,685	$47
91	---	**Inland Steel Industries, Inc.** H. William Howard, VP	manufacturing	10	24,655	$70
92	---	**Eli Lilly and Co.*** Lee Gery, Director	pharmaceuticals	3	24,505	$39
93	---	**Merrill Lynch & Co.** DuWayne Peterson, Executive VP	financial services	14	24,475	$800
94	---	**The Mutual Life Insurance Co. of New York*** Gordon Duff, VP	financial services	15	24,470	$100
95	55	**J.C. Penney Co.** Dave Evans, VP	retailing	3	24,435	$201
96	---	**Enron Corp.*** Alberto Gude, VP	petroleum	9	24,430	$121
97	71	**Shawmut National Corp.*** Jay Roston, Senior VP	banking	11	24,425	$136
98	47	**Northwestern Mutual Life Insurance Co.** Edward A. Flitz, VP	financial services	16	24,420	$52
99	---	**The Aetna Life & Casualty Co.*** John D. Loewenberg, Senior VP	financial services	17	24,375	$500
100	---	**Jostens, Inc.*** Jack Yarbrough, Corporate Director	consumer products	5	24,365	$16

* Estimates are from *Computerworld* sources, not the company

IS budget as % of revenue	Processor market value (millions)	Market value as % of revenue	Total IS staff	% of IS budget for staff	% of IS budget for training	Total PCs and terminals	PCs/terminals: employees	'89 profit (millions)
3.49%	$60	0.55%	1,800	47%	1%	11,500	.82 : 1	$725
4.3%	$225	2.27%	3,500	40%	5%	41,000	.50 : 1	$2
1.04%	$7	0.09%	425	45%	.08%	5,600	.34 : 1	$85
2.69%	$60	1.11%	1,450	52%	1%	15,000	.35 : 1	$860
2.67%	$32	0.91%	NA	43%	4%	6,644	.71 : 1	$96
4.08%	$34	1.33%	NA	36%	5%	6,418	.44 : 1	$263
1.98%	$42	1.15%	750	35%	4%	10,400	.54 : 1	$520
2.56%	$22	1.21%	487	54%	5%	7,381	.39 : 1	$169
1.25%	$7	0.19%	NA	41%	3%	4,285	.92 : 1	$44
2.27%	$200	1.2%	3,000	37%	1%	43,000	.43 : 1	$704
0.98%	$5	0.67%	NA	38%	3%	846	1.21 : 1	$44
1.51%	$20	0.72%	NA	36%	5%	13,394	.36 : 1	$14
1.5%	$24	0.47%	NA	44%	2%	5,950	.25 : 1	$280
0.93%	$32	0.29%	NA	43%	3%	16,617	.27 : 1	$945
1.97%	$24	1.01%	NA	42%	4%	2,051	.12 : 1	$103
1.69%	$11	0.27%	420	30%	.1%	5,400	.27 : 1	$241
0.93%	$16	0.38%	NA	45%	5%	24,995	.89 : 1	$940
7.06%	$100	0.88%	3,500	40%	3%	17,000	.41 : 1	$(213)
2.61%	$32	0.84%	NA	47%	2%	7,025	1.58 : 1	$12
1.23%	$125	0.76%	1,824	38%	1%	89,000	.45 : 1	$802
1.23%	$31	0.31%	NA	39%	4%	3,468	.55 : 1	$226
6.01%	$15	0.66%	NA	42%	.4%	11,302	.88 : 1	$(129)
0.82%	$15	0.24%	464	64%	1%	6,194	.60 : 1	$372
2.54%	$93	0.47%	NA	38%	2%	25,000	.56 : 1	$300
2.3%	$2	0.27%	NA	41%	1%	1,000	.12 : 1	$54

MCI: Making the Most of a Delivery Network


Katherine Lambert

MCI's Ditchfield *successfully juggles business and technological concerns*

BY AMY BERNSTEIN

When you ask MCI Communications Corp.'s technology guru Allan Ditchfield when he thinks the company will overtake archrival AT&T, he doesn't laugh, he ponders. Then he replies: "Our compounded growth rate is about 20% a year. Just draw the curve."

He's only half-kidding. If MCI is due for a large dose of humility, the company is not likely to have to swallow hard anytime soon. MCI's hubris is justified so far by its dazzling performance. The company is among the best in the world when it comes to applying technology to solve customer problems, build strategic alliances and seize market opportunities.

MCI wins not only the No. 1 spot in its industry in the *Computerworld Premier 100* for the second consecutive year, but it also ranks No. 1 in the overall survey.

To fully appreciate precisely what MCI does so well, you should first know how well the nation's second largest long-distance telephone company is doing.

Consider these figures: Revenue for 1990 will reach $7.9 billion, a 21% jump over 1989, capping four steady years of growth in earnings and profitability. Operating margins lead the industry at approximately 16% vs. AT&T's 12% to 13%. Average revenue per employee ($355,000) is the highest in the industry. Return on equity leads the industry at 32%. And billable calls increased 40% in 1989.

What statistics cannot convey is how MCI achieves this level of performance year after year in the highly competitive $55 billion long-distance telephone and communications business.

The company views its network as a delivery system for the transaction services and applications that customers demand. The network is not just a highway for applications to ride along but also a platform MCI uses to develop and deliver customized services.

In this context, no single service — neither the highly touted Portfolio electronic billing system nor the Vision package being offered to small businesses — is the star of the MCI show. The real star is the company's ability to deploy computer power where and when it is needed to meet specific customer demands faster than anyone else.

"We understand how important it is to make our infrastructure flexible enough to move from market to market," says Ditchfield, senior vice-president responsible for companywide engineering and information systems operations.

Indeed, according to The Yankee Group, a Boston-based industry research firm, MCI may have the largest mainframe-based distributed processing network of all the long-distance companies.

Of the $1.2 billion that MCI will invest in network enhancements in 1990, much will be spent on improving and expanding the hardware and software platforms designed to deliver real-time services to customers.

Ditchfield is the architect of MCI's transaction processing strategy, which he calls "process integration." With process integration, the network is the integrated delivery mechanism for all customer services, from customized billing to customer-controlled maintenance.

"If you've got the right funnel to implement the right customer ideas," Ditchfield says, "then and only then are you free to create services that ultimately lead to increased revenue and market share."

Process integration also leads to significant operating economies. For example, at MCI's North Royalton, Ohio, integrated network control and data center, the ability to switch intelligent network and IBM 3090 mainframe platforms together — rather than plan, build and run switch facilities and data centers separately — requires two-thirds fewer staff.

In essence, "we've collapsed functions and groups so that MIS and engineering are together, thereby reducing double-planning and double-billing," says James Zucco, MCI's vice-president of product development.

"We'll see MCI move increasingly from offering commodity transmission services to high-value transactions that customers can utilize on a usage-sensitive basis," says Berge Ayvazian, a vice-president at The Yankee Group. K Mart Corp., the nation's second largest retailer, is one customer benefiting from this custom-tailored approach. K Mart uses MCI's Vnet (a large private network) to link 3,400 K Mart and Waldenbook, Inc. stores, distribution centers and offices across the country.

Naturally, there has to be a cloud or two in MCI's silver lining. Ironically, because the company has focused on developing its IS capabilities over the past few years, MCI has not kept pace with the all-digital revolution. Thus, MCI is the only leading long-distance carrier to invest as much as $1.1 billion this coming year to transform its telephone network, resulting in a third-quarter writedown of about $500 million.

What makes MCI IS so effective?

- **Network is used to develop and deliver customer services.**
- **Technology acquisition through mergers.**
- **Strong use of strategic partners such as Visa.**
- **IS closely allied with network engineering.**

While its relationships with other companies will help minimize the time and investment required for the conversion, it is likely that some of MCI's creative energies will be siphoned off into this effort.

Ironically, MCI could find itself the victim of success. As the company becomes more aggressive in the transaction processing arena, it may have trouble linking up with strategic partners to leverage its capabilities.

According to Ayvazian, companies such as J.C. Penney Co., which operates substantial credit-clearing networks, will begin asking, "Is MCI my carrier or my competitor?" MCI will be forced to draw clear strategic boundaries separating its networked transaction processing from others. ☐

Bernstein Heads Gavroche Associates, A Communications Consulting Firm In Baltimore.

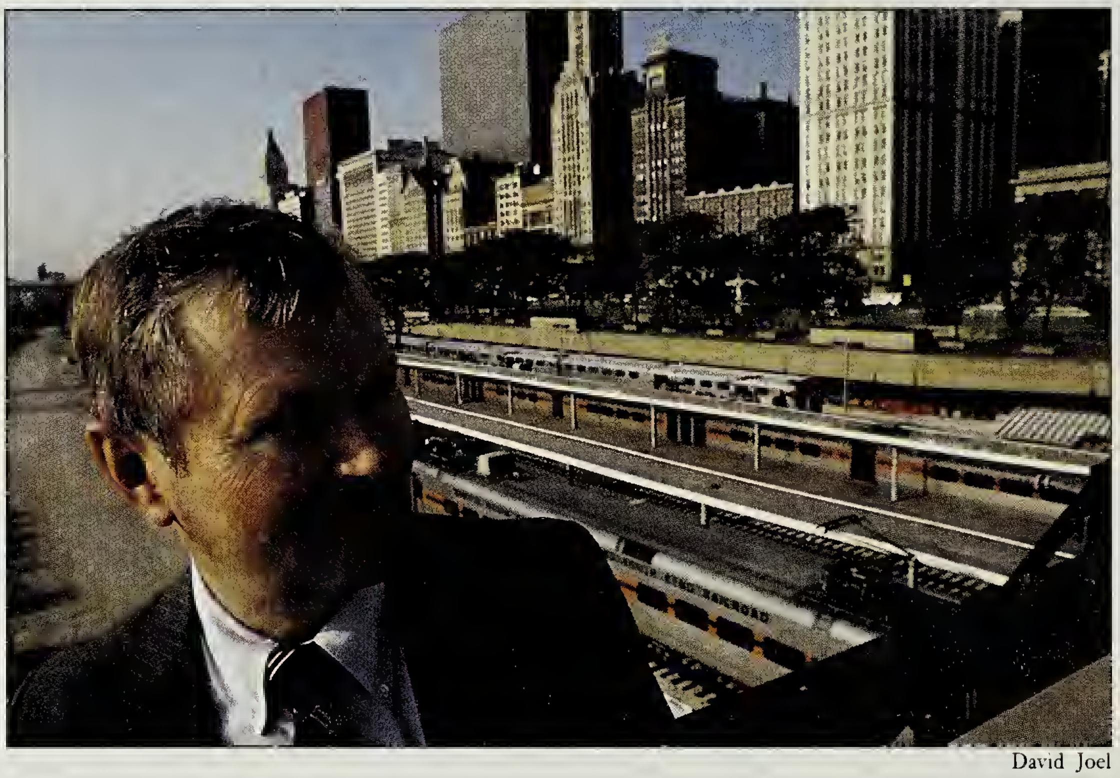
Utilities

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**MCI Communications Corp.** Washington, D.C. 19,000	1	28,530	$529	$400	29,500
2	**United Telecom, Inc.*** Kansas City, MO 41,359	18	27,060	$363	$138	38,636
3	**GTE Corp.*** Stamford, CT 158,500	21	27,000	$1,417	$750	90,000
4	**Bell Atlantic Corp.** Philadelphia, PA 79,100	22	26,930	$1,070	$709	66,000
5	**Ameritech Applied Technologies** Chicago, IL 75,900	23	26,895	$1,238	$880	65,000
6	**US West, Inc.** Englewood, CO 70,200	27	26,645	$1,111	$263	105,000
7	**Southwestern Bell Corp.** St. Louis, MO 66,200	29	26,610	$1,093	$294	61,700
8	**Contel Corp.*** Atlanta, GA 21,800	39	26,305	$287	$150	5,000
9	**Northeast Utilities** Hartford, CT 8,400	45	25,835	$203	$73	5,033
10	**Centerior Energy Corp.** Cleveland, OH 9,000	47	25,755	$277	$30	4,952
Medians for industry Top 10		**25**	**26,770**	**$800**	**$279**	**50,168**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

FMC Mixes Crisp Efficiency With Latest Technology

BY MICHAEL SULLIVAN-TRAINOR



David Joel

FMC's Irwin *keeps an eye on technological advances and bottom lines*

Even though his company has extensive business in the Middle East, FMC Corp. Vice-President Dan W. Irwin has more pressing concerns than Iraq's invasion of Kuwait.

As vice-president of technology, manufacturing and information services, Irwin is charged with ensuring that FMC's IS operations are run as cost effectively as possible while still taking advantage of the latest technology when it fits company needs.

The combination of an aggressive technology evaluation strategy and the cost efficiency policy is paying off for the $3.4 billion company, which ranks second in the *Computerworld Premier 100* and is No. 1 in the chemical industry. A diversified company, FMC is a market leader in segments of the chemical, defense and gold-mining industries.

The company's recent investments in technology, combined with an ability to get the most out of its information systems for solid business performance, caused FMC to skyrocket nearly to the top of the 1990 list.

For example, IS spending in the Agricultural Chemicals Group has increased 200% over the past three years, according to John Lowry, manager of the group's information resources. In addition, three plants were upgraded on the industrial chemicals side of the business, along with investments in computer systems for sales and marketing.

"Things are very strong for the company," says J. Jeffrey Cianci, an analyst at Bear Stearns & Co. in New York. "Their earnings are growing each year despite a slowdown in business. They have solid management."

FMC's capital spending in the industrial chemical business is expected to show dividends this year, he adds, and the Middle East conflict will bolster the company's defense business despite future U.S. spending cuts.

"Their spending is heavier than competitors in chemicals, but they have a strong cash flow so they don't have to borrow to expand," Cianci says.

The availability of funds to invest in plants and technology does not mean that FMC is willing to throw its money around, however. This is particularly true in Irwin's IS operation. "We look very closely at the value of our applications and assess the alternatives. We reduce everything we can to some kind of number," he says.

The key to FMC's IS strategy is flexibility at the corporate level, combined with a culture that emphasizes efficiency foremost. "We will do our computing operations only where it makes the most sense, and that is driven by the nature of the application," Irwin says. "In addition, we strive for very high levels of service at the best cost you can get."

As a practical matter, the emphasis on service weighs more heavily in the use of hardware than software. While the company has an aggressive leading-edge strategy — moving to state-of-the-art equipment when it makes sense for the company — no system is allowed to waste processing cycles for the sake of staying current.

For example, at the company's Dallas data center, which does the majority of processing for five business units, including the chemical operations, the unit cost of CPU use has decreased 50% since 1986, while use itself has increased 300%. These efficiencies are made possible by investments in the latest IBM mainframes.

NEW APPLICATIONS RESEARCH

On the software side, the company is pursuing a different type of advanced strategy. With computer-aided design and manufacturing devices a key element in chemical modeling and defense equipment design, FMC is running engineering applications at the National Center for Supercomputing Applications in Champagne-Urbana, Ill. The research is designed to determine how to make supercomputers more effective in supporting three-dimensional computer-aided image modeling.

While laying down ground rules such as cost efficiency, FMC's corporate IS group tries to remain open to the diverse needs of IS groups in the various business units. "Each unit has its own style that is influenced by the management. You'll find a different flavor of ice cream in Philadelphia [where the chemical operations are located] than here. The units have a great deal of autonomy, and we try and develop consultive relationships between our corporate staff and the line organization," Irwin says.

What makes FMC IS so effective?

- **Rigorous cost-effectiveness measures.**
- **Aggressive investments in efficient technology.**
- **Flexible standards dictated by corporate IS.**
- **Understanding of the diversified nature of business.**

Customer information is currently the focus of investments in Lowry's group. The IS staff there is upgrading its front-end customer applications from a batch system to a relational database using Oracle Systems Corp.'s Oracle on a Digital Equipment Corp. VAX platform. The project, which is being conducted by the Dallas data center, is unusual in a primarily IBM environment, but it is the solution that best suits the unit's needs. It is also one of the first on-line applications to use DEC's XI packet-switched network over a Systems Network Architecture backbone.

Ground-breaking projects are not unusual at FMC, where the industrial chemical division operates a state-of-the-art order-entry and inventory system that provides automatic freight rating of chemical products. "It's the Cadillac of the industry," Lowry says.

SULLIVAN-TRAINOR IS A COMPUTERWORLD SENIOR EDITOR, FEATURES.

Chemicals

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**FMC Corp.*** Chicago, IL 24,110	2	28,450	$136	$110	7,200
2	**The Dow Chemical Co.** Midland, MI 62,100	20	27,050	$2,486	$347	32,000
3	**Air Products & Chemicals, Inc.** Allentown, PA 10,500	25	26,685	$289	$46	5,180
4	**Monsanto Co.** St. Louis, MO 42,179	37	26,365	$679	$190	15,000
5	**The B.F. Goodrich Co.*** Akron, OH 11,892	46	25,805	$172	$53	4,959
6	**Rohm & Haas Co.*** Philadelphia, PA 13,132	52	25,620	$176	$53	12,063
7	**Union Carbide Corp.** Danbury, CT 45,987	62	25,380	$1,269	$700	5,000
8	**Quantum Chemical Corp.*** New York, NY 10,000	67	25,245	$247	$69	5,538
9	**Valhi, Inc.*** Dallas, TX 16,500	90	24,685	$103	$47	2,051
10	**Du Pont Co.*** Wilmington, DE 145,787	117	23,930	$2,480	$1,050	36,909
Medians for industry Top 10		**49**	**25,713**	**$268**	**$90**	**6,369**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

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Bankers Trust Architects a Global Plan

Flexibility lets IS react to both markets and technology

BY SALLY CUSACK

While many information systems organizations are only now awakening to the need to see their companies as worldwide operations, Bankers Trust Co. began its preparations for a global IS support system five years ago.

In 1985, Carmine Vona, executive vice-president and chief technologist at the firm, devised a flexible technology architecture that would support long-term global business needs. The strategy calls for regenerating the architecture itself as the market changes and technology progresses.

Today, Vona's vision has paid handsome dividends: Bankers Trust has built a worldwide systems infrastructure that permits real-time operation around the globe from branches in the U.S., Europe and the Far East.

Getting a global head start has helped Bankers Trust become one of the most effective users of information systems and No. 1 among banks listed in the *Computerworld Premier 100* for the second consecutive year. Bank officials say that vision is definitely long-term.

Joyce Ravid

Bankers Trust's *Mathai seeks continuous, evolutionary changes in systems architecture*

"The entire thrust of the architecture is evolutionary," explains Anish Mathai, a Bankers Trust vice-president and technical architect. "There never will be a finished product. It will grow as computer technology grows."

For example, the firm recently installed 250 Digital Equipment Corp. Vaxstations in its offices in London to access trading floor applications. The systems access an Ultrix-based equity system also used by its Tokyo operation.

Founded in 1903 as a trust company and becoming a commercial bank in 1917, Bankers Trust sold its retail banking network in the early 1980s to redirect its resources toward wholesale banking. The forces behind that change, then-Chairman Alfred Brittain III and future Chairman Charles S. Sanford Jr., devoutly believed that restructuring was the way to remain competitive in the industry. The company abandoned its traditional management hierarchy to embrace a philosophy of integration and cooperation within a horizontal framework.

Currently focusing its businesses on major corporations, financial institutions, governments and select individuals, the bank is organized into two principal units; Financial Services, which incorporates the lending, intermediary, advisory and trading capabilities of the firm, and Profitco, comprised of the bank's trust, investment management, securities processing, cash management and private banking businesses. Corporate debt underwriting power is exercised by an affiliate, BT Securities Corp.

The success of Bankers Trust merchant banking strategy has been demonstrated by the bank's strong earnings performance. Net income increased from $114 million in 1979 to $620 million in 1989. The figures, which exclude special provisions for South American loan losses in 1987 and 1989, reveal that BT is one of the most profitable major banks in the U.S. based on return equity in excess of 16% for each of the last 10 years.

With the sale of the bank's retail branch network, the company now operates three private banking centers in New York; Miami; West Palm Beach, Fla.; Chicago; Los Angeles; and San Francisco. The bank also maintains representative offices and subsidiaries in major offices throughout the U.S. and has an international network of branches, representative offices and subsidiaries

Continued on page 34

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Continued from page 31

in more than 35 countries.

To accommodate the bank's structural changes and prepare for long-term needs, Bankers Trust's IS organization initiated Vona's architecture project. At the time, a handful of skeptics at the firm opposed the plan because they feared that an architectural approach would become a money pit.

Today, Vona can say "I told you so" to his critics. In fact, Vona says, instead of costing money, the right IS architecture, properly implemented, actually saves money. As proof, he points out that the bank spends far less on IS than some of its major competitors while achieving much larger gains.

The architecture's foundation is rooted in a strong central management structure — almost paradoxical, given the company's pioneering efforts in decentralization.

What makes Bankers Trust IS so effective?

- **Well-defined business and IS strategy.**
- **Freedom in software applications development.**
- **Flexibility to implement new technologies.**
- **Tightly controlled buying process.**

A decentralization pioneer, Bankers Trust is organized into more than 20 decentralized, self-managed business units, each with its own IS support center. Despite this independence, a strong, centralized IS group also remains. Senior IS executives are known as "information architects."

Each division is part of an individual technology center, which must use IBM or DEC hardware and operating systems while adhering to the CCITT X.25 protocol for communications standards. However, maintaining uniformity is not always easy.

Mathai explains, "Sometimes we have to sacrifice local advantages for global advantages . . . and corporate strategy. This can be a major hurdle. It's an ongoing process, and local people always want to be the one exception."

Software is a different story. Although the central IS group has full veto power over every project and purchase, the group rarely intervenes in applications decisions. For example, a new equity application — the first using Ultrix — was developed entirely in-house to meet the requirements of the division.

EVER CHANGING WORLD

While bankers trust got a head start in globalization, it knows the world is not standing still. Looking ahead, Vona sees work on the horizon. One possibility is for a universal stock market in 10 or 15 years, above and beyond the foreign exchange.

Fortunately, he says, the bank's evolutionary architecture will let the company take advantage of new markets and technologies as they become available. This will let the bank keep pace with the world's financial direction by building systems that track risks and operate across all markets.

The goal? "Optimize technology as it appears," Vona says. As an example, he says he foresees that by 1995, desktop devices will provide "phenomenal" computing power. "We must be ready to integrate applications, discipline and tasks into these tools."

Vona predicts that employees will soon have the capacity to double and even triple their productivity. To that end, the architecture at Bankers Trust will evolve to develop software and infrastructures that bring technology "to their fingertips and keep us at the forefront of the industry."

Meanwhile, current events continue to test the strength of Bankers Trust's IS capabilities. For example, the August blackout that shut down numerous systems in Manhattan did not hurt Bankers Trust. "We experienced no problems, not even a split second. We are one of a very few that can say that," Vona says. ☐

CUSACK IS A COMPUTERWORLD STAFF WRITER

Banking

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Bankers Trust N.Y. Corp.** New York, NY 13,800	3	28,200	($980)	$400	9,000
2	**Norwest Corp.** Minneapolis, MN 18,485	8	27,710	$237	$133	15,500
3	**Banc One Corp.** Columbus, OH 24,000	9	27,565	$363	$235	14,000
4	**Signet Banking Corp.** Richmond, VA 5,700	15	27,210	$123	$57	7,107
5	**Security Pacific Corp.** Los Angeles, CA 41,100	17	27,105	$741	$431	31,000
6	**Corestates Financial Corp.** Philadelphia, PA 12,000	19	27,055	$240	$71	10,000
7	**Bankamerica Corp.** San Francisco, CA 56,420	40	26,300	$1,103	$497	73,000
8	**Wells Fargo & Co.*** San Francisco, CA 19,600	56	25,575	$601	$206	16,663
9	**J.P. Morgan & Co.** New York, NY 14,000	76	25,030	$725	$382	11,500
10	**National City Corp.*** Cleveland, OH 14,600	81	24,935	$263	$104	6,418
Medians for industry Top 10		**18**	**27,080**	**$313**	**$221**	**12,750**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

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AMR Hones Sabre to Sharpen Competitive Edge

BY CONNIE WINKLER

After creating what is perhaps the most successful strategic information system to provide a true competitive advantage, AMR Corp. is breaking the mold.

The company is doing the unthinkable — carving up its near-legendary innovation, the Sabre computerized reservation system (CRS).

By gradually breaking off chunks of computing from the monstrous mainframe-based Sabre system, AMR — parent of American Airlines — is hoping to reap further advantages from its strategic applications. "We're trying to get ourselves prepared to take advantage of new technologies, which may represent better opportunities," says Thomas J. Kiernan, president of AMR's Sabre Computer Services Division at the Dallas/Fort Worth airport.

Indeed, Max Hopper, AMR's IS superstar, placed an article called "Rattling Sabre — New Ways to Compete on Information" in the May/June 1990 issue of the *Harvard Business Review* proclaiming Sabre's renovation. "While it is more dangerous than ever to ignore the power of information technology, it is more dangerous still to believe that, on its own, an information system can provide an enduring business advantage," Hopper wrote. "The old models no longer apply."

How well the new strategy will work for American Airlines remains to be seen. The back-to-technology push for AMR comes at a time when the airline and industry is caught between a rock and a hard place, as some analysts describe it.

AMR, along with all domestic airlines, faces crazy fuel prices, declining passenger loads and squeezed profits. And AMR, considered one of the strongest in the airline group, recently had its debt rating downgraded by Standard & Poor's Corp.

"The kind of business environment we are in is when Sabre and computerized reservation systems really earn what's put into them," says Edward J. Starkman, who follows the airline industry for Paine Webber, Inc. in New York. "When pricing is difficult and passenger loads are soft, you squeeze everything you can [from the CRS]."

The catch-22 to the new strategy, however, is that it's the old mainframe-based Sabre that has carried AMR successfully in the past and has helped AMR, for the second year, take top place in the transportation industry and fourth place overall in *Computerworld*'s *Premier 100.* Sabre accounts for about 85% of American Airlines' earnings.

Stan Wolenski

AMR's Kiernan: *Like changing the wheels on a moving tractor trailer*

As long as American Airlines maintains control of Sabre processing, Starkman says he is not concerned about distributing the giant system. "It makes me more antsy to have everything in a bunker in Tulsa, as opposed to distributing it," he says.

AMR could not carve up Sabre until it unlaced the IBM operating system holding it together. During the past year, AMR spent 230 to 240 man-years swapping over to IBM's TPF 3.1 operating system. "It was analogous to changing the wheels on a tractor trailer while the truck was speeding along," Kiernan says.

One processing chunk AMR has already broken off the mainframe is crew planning — scheduling 8,000 pilots and 16,000 flight attendants. The application now runs on a Mips Computer Systems, Inc. processor and workstations, with the basic flight schedule data downloaded from the Sabre system.

LOOKING INWARD

AMR is also rethinking its internal computing needs, notably with the Interaact system. The aim of Interaact is to provide computing power to every knowledge worker at AMR.

With Interaact, Kiernan says, the various AMR IS groups are focusing on information sharing and providing users with the tools they need.

Beginning in August 1989, AMR put Interaact MS-DOS personal computers on about 1,400 desks in the Fort Worth headquarters and Los Angeles offices. However, the Interaact systems from AT&T, Tandy Corp. and IBM didn't provide the ease of use or Sabre response time users demanded.

"Quite frankly," Kiernan acknowledges, "we got too interested in rolling out the technology and getting users to change how they did work."

IS went back to the drawing board to "clean up the product" and focus on departments' and individuals' needs.

After the Sabre group reviewed users' needs for strong Sabre access, the Interaact Sabre emulation program was rewritten and enhanced.

"We've been on track since March," Kiernan says. "There's an absolute commitment to training [by all parties] and to looking at how people do their jobs."

While AMR is decentralizing its computing, it is centralizing its communications infrastructure on a global basis. Again, the decision is for cost and price/performance reasons.

What makes AMR IS so effective?

- **Industry-leading computer reservation system.**
- **Willingness to improve on success.**
- **Moving computing power to end users.**
- **Clear understanding of where IS fits into the business.**

Currently, AMR runs three separate networks: an older, 6-bit one for Sabre; an IBM Systems Network Architecture network for internal business; and the new X.25 configuration.

"The single X.25 network will improve reliability and reduce costs, most simply by eliminating the other two networks," Kiernan says.

AMR seems to be opening itself up to the new possibilities of technology, especially to provide better customer service. Besides a baggage bar-coding system, AMR is considering multimedia systems, compact disc/read-only memory and PCs that would store maintenance manuals or sales information and presentations for travel agents. ☐

WINKLER IS A NEW YORK-BASED WRITER AND CONSULTANT COVERING MANAGEMENT TECHNOLOGY

Transportation

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**AMR Corp.** Dallas, TX 95,800	4	28,100	$455	$1,214	124,000
2	**Chicago & North Western Co.*** Chicago, IL 7,562	14	27,250	($21)	$42	4,590
3	**Federal Express Corp.** Memphis, TN 87,000	28	26,625	$413	$234	30,000
4	**CSX Corp.** Jacksonville, FL 40,056	55	25,590	$770	$220	12,328
5	**American President Companies** Oakland, CA 4,396	105	24,245	$11	$95	4,300
6	**Continental Airlines Holdings, Inc.** Houston, TX 68,000	112	24,055	($886)	$300	130,000
7	**Delta Air Lines, Inc.*** Atlanta, GA 58,784	147	23,530	$461	$168	35,786
8	**United Air Lines, Inc.** Chicago, IL 71,000	183	23,010	$324	$306	19,000
9	**United Parcel Service*** Greenwich, CT 237,700	263	21,905	$693	$425	11,286
10	**NWA, Inc.*** St. Paul, MN 39,323	294	21,465	$355	$133	9,981
Medians for industry Top 10		**109**	**24,150**	**$384**	**$227**	**15,664**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

Building Systems From the Bottom Up

By Clinton Wilder

Mark Green

IS director White: *'We don't form a committee . . . and sit around.'*

Delegating responsibility to users is a big part of how Union Texas Petroleum's IS department does business

Some say that in order to strengthen information systems management, you have to give power away to business managers. At Union Texas Petroleum Holdings, Inc. in Houston, director of MIS Richard L. White says he believes that philosophy is a big reason why his company was ranked as the most effective user of IS in the petroleum industry for the second straight year.

For most of the major applications in the works at Union Texas, White has given project responsibility to a manager in the department that will use the application. In addition, an attempt to create a data model for Union Texas' global enterprise is primarily a project for users, not "data administrators" in IS.

"We tried in 1984 and 1985 to do it the way all the gurus said to do it — top down," White says. "That doesn't work in this organization. The people who use the data must define it."

Union Texas is one of the world's largest independent oil and natural gas producers, meaning it does no refining or "downstream" selling of its products to consumers. White says he believes that the company's sharp focus gives it an edge over much larger and more diversified competitors, and he tries to bring a similar focus to IS.

"If something is obvious, we don't form a committee of 25 and sit around deciding what to do," he says. "Decisions are made very quickly."

And with strong participation by users, systems are developed at a pretty good clip as well. The first phase of an IBM 3090 and DB2-based procurement tracking system that will completely automate the firm's purchasing was implemented ahead of schedule in August, less than two years after the specification process began.

White is almost zealous in keeping the IS focus on business rather than technology. Not that Union Texas doesn't use state-of-the-art technology in specific strategic areas, such as Landmark Graphics, Inc. software for seismic exploration or four new Sun Microsystems, Inc. Sparcstations for a new geo-

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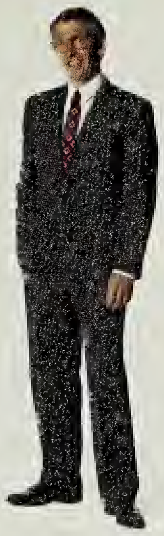
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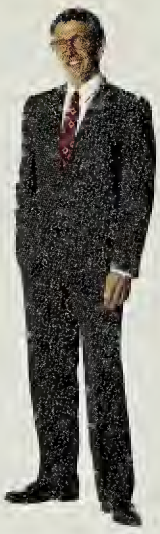
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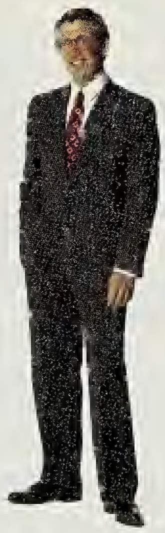
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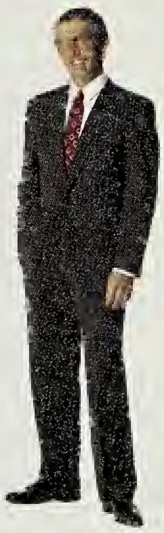
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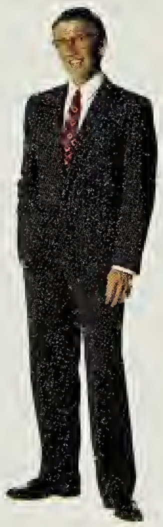
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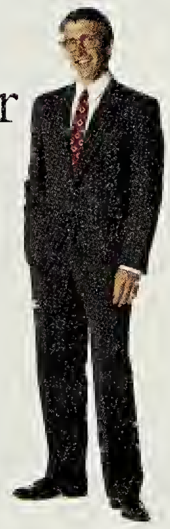
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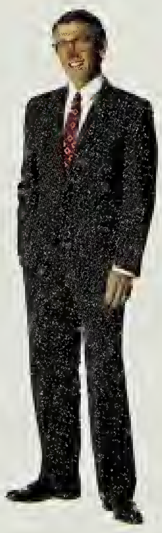
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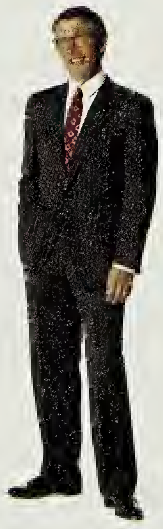
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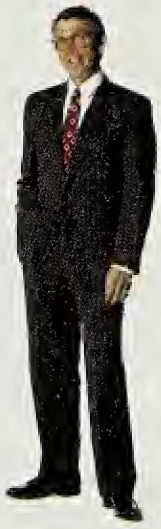
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Continued from page 38

logical/geophysical system.

However, you won't find any computer-aided software engineering tools in use here, although they are being studied; White says that client involvement is more important than new development tools. And don't ask him for the Sparcstation model numbers, because he won't know off the top of his head.

On the other hand, he and his department do understand, for example, the information needs of natural gas engineers who use 90 personal computers in Union Texas' operations in Karachi, Pakistan.

"We don't try to be all things to all people," he says. "If a petrophysicist finds a great piece of software, our job is not to go out and find a better one — it's to help him."

What makes Union Texas IS so effective?

- **User department managers responsible for new systems specs and project management.**
- **Rigorous change control in systems development.**
- **IS staffed at or below previous year's level.**
- **Quarterly meeting of MIS Operating Committee approves IS spending above $50,000.**

A good example of that philosophy is rigorous change control in systems development. Any proposed deviation from the development plan must be approved by both White and the user department manager responsible for the system. "Analysts may tell you that their changes will only take one day, but nothing only takes a day," he says. Among the systems projects under way at Union Texas are the following major applications:

- Procurement tracking system. Undertaken in response to an internal audit that dictated better controls on purchasing, the system will automate a previously cumbersome purchase order system that involved much rekeying of data and manual checking. The system will also give managers immediate access to vendor credit information to allow them to make better purchasing decisions.
- Joint interest billing system. Complex joint ventures play a big part in Union Texas' $1.16 billion business. A 37.81% interest in a joint venture supplying natural gas to an Indonesian gas plant is but one of dozens around the world. A rejuvenated billing system is intended to give Union Texas' joint venture partners more precise billing information so they will pay bills faster and improve Union Texas' cash flow. The upgraded system will also feature better integration with other functions, such as accounts payable and materials transfer.
- Journal voucher entry system. A new system will bring 48 new PCs to accounting department employees for on-line entry, eliminating many "three- to six-floor elevator rides" to carry documents to the data entry department. The new PCs were cost-justified on the basis of eliminating several data entry jobs.

Whether Union Texas can make it three straight years as a *Computerworld Premier 100* industry leader in IS, however, may be out of White's hands. Last spring, Union Texas owners Kohlberg Kravis Roberts & Co. and Allied-Signal, Inc. announced that the company is up for sale. That in itself gave IS a new responsibility: supporting a "data room" where prospective buyers from around the world can examine data on everything from oil rigs to shale deposits to employee benefits.

The sale of Union Texas may be announced before the end of the year, but with the exception of 1991 budgets, life in IS is proceeding as normal. "Our people still take a lot of pride in their systems and in meeting their schedules," White says. "No one's pulling their horns in." ☐

WILDER IS COMPUTERWORLD'S SENIOR EDITOR, MANAGEMENT.

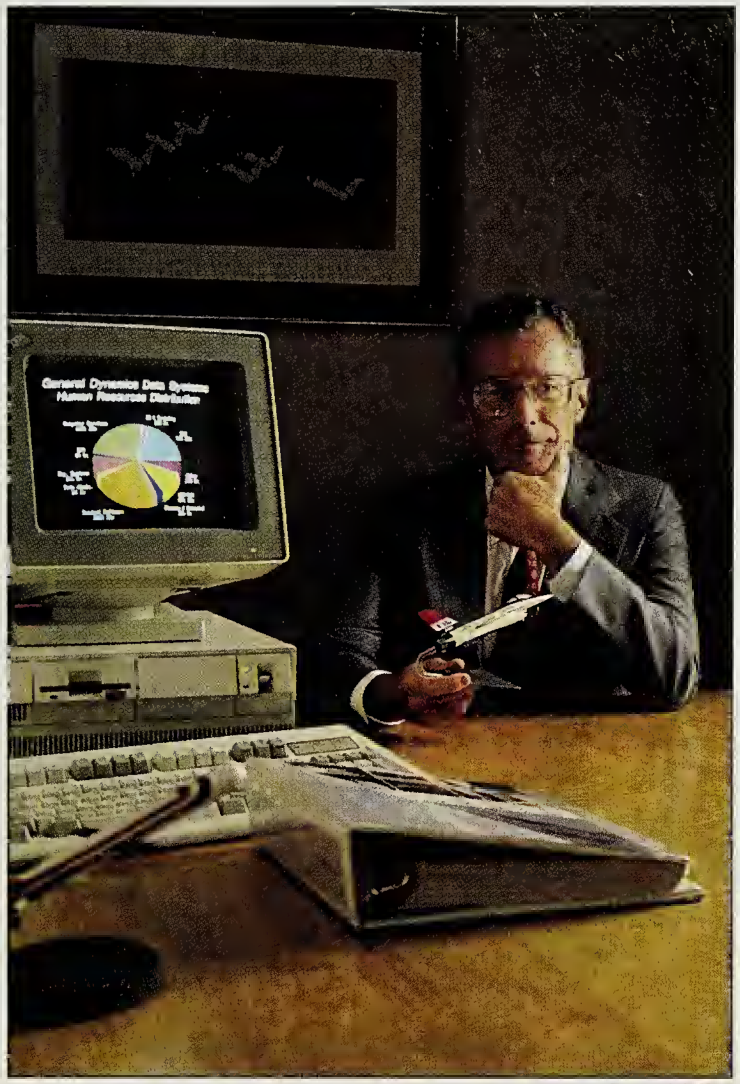
Petroleum

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Union Texas Petroleum, Inc.** Houston, TX 1,900	5	27,905	$173	$18	1,800
2	**Atlantic Richfield Co.** Los Angeles, CA 27,200	31	26,465	$1,953	$237	15,000
3	**Oryx Energy Co.** Dallas, TX 2,920	32	26,455	$124	$27	3,200
4	**Phillips Petroleum Co.** Bartlesville, OK 22,310	33	26,440	$219	$160	13,470
5	**Mobil Corp.** New York, NY 67,900	68	25,180	$1,800	$740	40,000
6	**Freeport McMoran, Inc.** New Orleans, LA 3,700	70	25,150	$150	$17	1,000
7	**Sun Co., Inc.** Radnor, PA 16,500	78	24,980	$85	$80	5,600
8	**Louisiana Land & Exploration*** New Orleans, LA 700	86	24,735	$44	$7	846
9	**Enron Corp.*** Houston, TX 6,296	96	24,430	$226	$121	3,468
10	**Shell Petroleum, Inc.*** Houston, TX 31,338	122	23,875	$1,405	$200	21,376
Medians for industry Top 10		**69**	**25,165**	**$196**	**$101**	**4,534**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

99% Perfect Not Enough for General Dynamics

Systems steer the quest for flawless quality control at aerospace firm



Doug McKay

General Dynamics' Hall *demands top quality*

BY MITCH BETTS

It seems like such a small difference, the one between 99% and 100% quality. But for General Dynamics Corp. and other devotees of the Total Quality Management (TQM) philosophy, it is a very big difference indeed.

Consider, for example, that 99% quality control at the U.S. Postal Service would mean the loss of 17,000 letters per hour. At the nation's hospitals, it would mean 30,000 newborn babies accidentally dropped each year.

At St. Louis-based General Dynamics, the nation's No. 2 defense contractor, TQM means building tank hatches with a 100% seal and building information systems that *exactly* meet the requirements of the business units. As a general rule, it means making continuous process improvements to ensure that things are done right the first time.

No one claims that General Dynamics has reached perfection in any area, but the very fact that it tries so hard may help to explain why it ranks as the top aerospace company in the *Computerworld Premier 100* for the second straight year.

"We are heavily into TQM ... trying to compare how we're operating vs. the best practices in the information systems field," says Asaph "Ace" H. Hall, corporate vice-president and general manager of the Data Systems Division.

For Hall, the beauty of TQM is that it calls for the involvement of all employees in the relentless pursuit of quality and customer satisfaction. "I'm convinced there's a lot of gold there, because people get very excited when they're empowered to go out and find better ways to do things," he says.

Within the Data Systems Division, for example, one of the five "critical process teams" is focusing on the process of defining user requirements for applications software — and the team leader is a user. The goals are to find out what users *really* want out of a system and define those specifications faster, according to Larry Feuerstein, the division's vice-president of planning and quality assurance.

By improving the quality of the requirements-definition phase, General Dynamics hopes to avoid those situations in which the system has to be reworked because "you didn't get clear indications from the user or you weren't talking to the real user and you find out at the first review that you didn't really understand the requirement," Feuerstein says.

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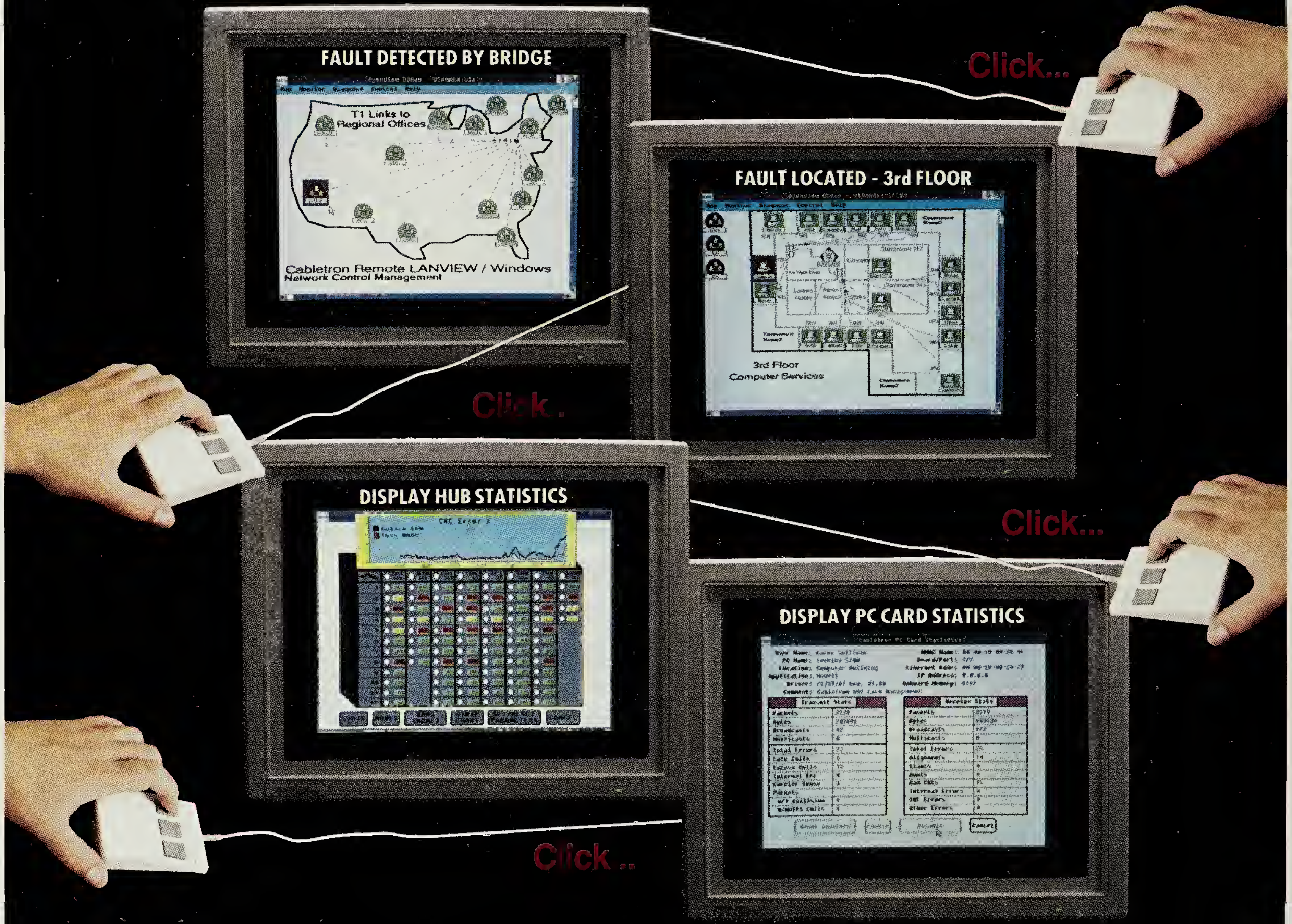
10BASE-T NETWORK MANAGEMENT MADE EASY.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Continued from page 41

What makes General Dynamics IS so effective?

- **Clearly stated IS management vision.**
- **Strong commitment to IS quality program.**
- **Strong user role in defining applications.**
- **Advanced factory-automation applications.**

The Data Systems Division is also heavily involved in the quality-improvement projects at the other business divisions. A few years ago, Hall says, "somebody would have thrown a requirement over the wall and told us to code a system to do this. Now we help them improve the process before they even consider how to automate it." The key, he adds, is getting IS staff members included in the project team at the outset.

The biggest change at the IS unit over the last few years, Hall says, it that "we have moved even more toward the business orientation — having a direct relationship with the business of General Dynamics — as opposed to being as technology-driven as we may have been in the past."

The big problem is that the business of General Dynamics is headed for some hard times now that the Cold War is over and lawmakers are preparing to slash the defense budget. Wall Street analysts say they expect the firm's earnings, which were about $7 per share in the past two years, to fall to $6.54 per share or lower this year.

As unseemly as it sounds, the only good news for the arms maker is that protracted turmoil in the Middle East may boost its foreign sales of M-1 tanks and F-16 fighters, as well as curb Congress' appetite for military budget cuts, according to analyst Paul H. Nisbet at Prudential-Bache Securities, Inc.

Nevertheless, General Dynamics has announced layoffs of 1,500 to 2,000 workers through 1991, and analysts say it will have to continue to "tighten up and buckle down."

The Data Systems Division is consequently busy trying to streamline operations and cut spending to stay "in sync" with the business units. "Over the next three to five years, we're looking at something like a one-third reduction in our IS business, strictly as a result of what's happening in the aerospace business," Hall says.

General Dynamics is looking at some outsourcing options — it has already handed its wide-area network to AT&T under an $18 million Tariff 12 contract — but prefers to use outsourcing only for selected pieces of its IS operation. "We are not in the Kodak mode here of giving everything away," Hall says, referring to the full-scale outsourcing initiative at Eastman Kodak Co.

To outsiders, General Dynamics is best known for its accomplishments in factory automation, particularly at its plants in Fort Worth, Texas, and San Diego. At the Forth Worth facility, for instance, robots handle complex drilling tasks, apply sealant and install the correct rivets to assemble the F-16 aircraft.

"I've seen their paperless factory in San Diego and that seems like quite an advanced application," adds Richard Howard, the top IS executive at Northrop Corp. But technology aside, Howard says that General Dynamics' real strength is having a clearly stated vision for IS management.

Describing that vision, Feuerstein stresses that the Data Systems Division is run strictly as a service business, not as a "technical wonderland" or a collection of fragmented programs. "The customers are the other divisions of the company, so we work on things that are directly linked to the satisfaction of our division customers," he says. ☐

BETTS IS COMPUTERWORLD'S WASHINGTON, D.C., BUREAU CHIEF.

Aerospace

Industry rank	**Company** Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**General Dynamics Corp.** St. Louis, MO 95,000	6	27,855	$293	$585	28,000
2	**Gencorp, Inc.*** Fairlawn, OH 15,100	10	27,525	$210	$40	8,700
3	**Martin Marietta Corp.** Bethesda, MD 46,200	16	27,150	$307	$291	20,100
4	**Allied-Signal, Inc.*** Morristown, NJ 107,100	24	26,880	$528	$372	33,543
5	**Grumman Corp.** Bethpage, NY 28,000	41	26,055	$67	$241	16,200
6	**The Boeing Co.** Seattle, WA 164,500	49	25,715	$675	$1,164	91,964
7	**Northrop Corp.** Los Angeles, CA 38,000	51	25,625	($81)	$290	22,500
8	**United Technologies Corp.** Hartford, CT 190,400	59	25,475	$701	$847	35,918
9	**McDonnell Douglas Corp.** St. Louis, MO 127,000	65	25,310	$219	$755	70,000
10	**Textron, Inc.** Providence, RI 54,600	66	25,285	$259	$252	24,000
Medians for industry Top 10		**45**	**25,885**	**$276**	**$332**	**26,000**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

Benmosche *says employee contributions and interest keep Paine Webber in fighting shape*

Joyce Ravid

Strong Focus on People Powers Paine Webber

BY AMIEL KORNEL

On a clear day, staff members working up a sweat at Paine Webber, Inc.'s corporate health club have a panoramic view of downtown Manhattan. Wall Street's glass and steel peaks across the Hudson River are a constant reminder that they — and their company — need to stay in fighting shape.

These days, competing on Wall Street can challenge even the toughest players. To keep in the game, Paine Webber has whipped its information services unit into a trim, agile team. While information technology is highly valued at the company, the stock brokerage places a premium on what it considers its most valuable corporate asset — its employees.

"When you empower your people and make them feel they can contribute more to the organization, they produce more and you earn more," says Robert Benmosche, director of operations and systems.

Under the guidance of 46-year-old Benmosche, Paine Webber has implemented a number of measures that have helped keep information systems staff people motivated, highly skilled and loyal. This is no small feat in an industry renowned for its high employee turnover and fast-paced technological changes.

One of the world's largest securities brokerages, Paine Webber saw net earnings rise 4.8% to $25.4 million during the first six months of 1990, compared with the same period in 1989. Half-year revenue rose 11% to $1 billion.

As a result of the company's innovative management of its people, operational costs have shrunk while satisfaction with corporate IS services has grown.

The most visible such effort came during a cost-cutting measure in 1988, when the company moved its IS and operations facilities from the frenetic streets of downtown

Manhattan to slower-paced and lower-priced Wehawken, N.J.

The transfer across the Hudson was controversial at the time. Wall Street firms generally prefer keeping their technological nerve centers close to the action, and management feared a backlash from employees disgruntled with the move. Shareholders were not sure whether to cast a sympathetic eye, either: According to company financial statements, setting up and transferring to the new facilities cost about $50 million.

No one seems to doubt the wisdom of the move today, however. The new operations and systems facilities rent costs a third less than office space in Manhattan, Benmosche says. Also, the recent Manhattan power outage that shut down IS shops at many Wall Street firms for several days, forcing them to scramble to backup sites, made Paine Webber's move across the Hudson seem almost prescient.

Perhaps most importantly, the overwhelming majority of the stock brokerage's operations and systems staff have stayed with the company, Benmosche says. Eighty percent of the 740 IS people working for the company before the move are still with Paine Webber today, he says. Of the 20% that left, half did not need to be replaced thanks to improved efficiencies and productivity at the new site.

How did the company manage to hold onto its staff in spite of the upheaval invariably caused by a move?

The conveniences of the modern, spacious facilities, complete with health club, have helped preserve and even boost staff morale, according to Benmosche. The secret, however, seems to lie in a number of programs designed to afford employees continued training and high job mobility. "When you are ... committed to the people and their development," Benmosche says, "that tends to reduce turnover."

Benmosche, who worked as human resources chief at Chase Manhattan Bank NA, among his many previous professional incarnations, conducted an attitude survey among Paine Webber's IS staff in January 1989. He found that people believed that the firm did not offer them adequate career paths. "They said, 'We're not learning enough about the basic business, and we're not growing,' " according to Benmosche.

What makes Paine Webber IS so effective?

- **Minimal employee turnover.**
- **Policy of 'empowering' employees.**
- **Strategic relationships with major vendors.**
- **Move to distributed processing.**
- **Cost efficiency the No. 1 priority.**

Many staff members also demonstrated a surprising lack of knowledge about the firm's business. "They didn't understand how to solve problems; they only knew how to do their work," he says.

As a result, the company started a four-day course teaching employees the ins and outs of the brokerage business. It included field trips through the company as well as to the floor of the New York Stock Exchange.

Benmosche and his recently appointed chief information officer, Robert McKinney, have a mandate from Chairman and Chief Executive Officer Donald Marron to stay on top of the latest product offerings. No less than the company's survival is at stake.

"If you look at the last 20 years on Wall Street," Benmosche notes, "those who didn't keep pace with the technology and the efficiencies [it offered] were gobbled up by someone else." ☐

Kornel Is A Computerworld Senior Editor, Features.

Financial Services

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Paine Webber, Inc.*** New York, NY 12,900	7	27,755	$52	$200	10,357
2	**American Express Co.** New York, NY 105,000	26	26,675	$1,157	$874	70,000
3	**Pacific Mutual Life Ins. Co.*** Newport Beach, CA 3,471	34	26,420	$28	$57	1,900
4	**Salomon, Inc.*** New York, NY 8,900	36	26,395	$470	$335	6,105
5	**General Re Corp.*** Stamford, CT 2,379	44	25,855	$599	$87	1,920
6	**Mass. Mutual Life Ins. Co.** Springfield, MA 10,000	53	25,615	$124	$75	6,000
7	**New York Life Ins. Co.** New York, NY 18,200	54	25,600	$1,452	$156	10,000
8	**The Prudential Ins. Co.** Newark, NJ 100,209	57	25,550	$743	$818	65,200
9	**Primerica Corp.** New York, NY 24,000	58	25,480	$289	$183	15,625
10	**Metropolitan Life Ins. Co.** New York, NY 46,000	63	25,320	$300	$433	35,882
Medians for industry Top 10		**51**	**25,735**	**$385**	**$192**	**10,179**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

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Centralized, Revitalized IS Brings Sears into the '90s

Bigger, leaner Sears uses 'insourcing' to downsize and shake competition

BY JOSEPH MAGLITTA

Ask the average shopper about Sears, Roebuck and Co., and you'll hear of power tools, refrigerators, lawn mowers and chunky catalogs. True, the $54 billion company is still the country's largest retailer. But Sears has changed.

For the past decade, Sears has bounced through a dizzying series of corporate maneuvers and refocusing that would give most information systems departments a bad case of the heebie-jeebies. Yet Sears' IS has not only survived these mega-changes, it has evolved and *prospered.*

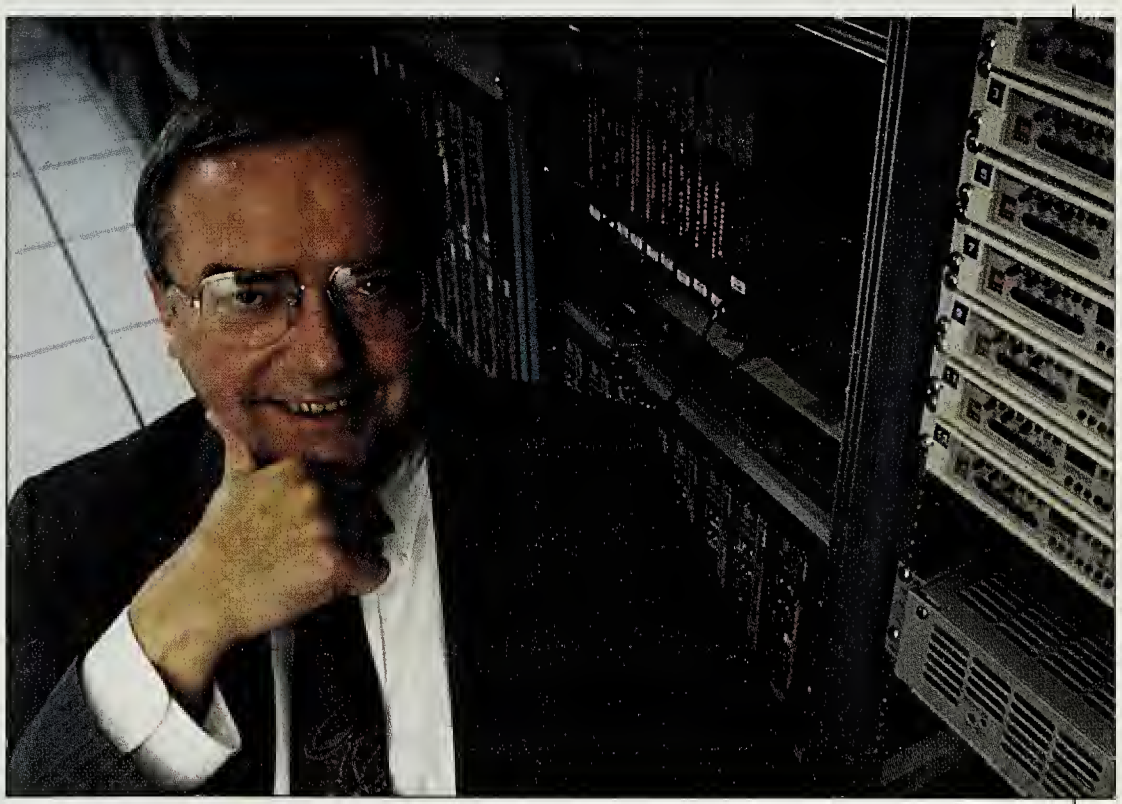
Today, the Chicago-based giant is aggressively using information technology to help shake off a dowdy retail image and propel it past a pack of fierce competitors and into the 1990s.

"We are technical enablers," says Charles A. Carlson, president of Sears Technology Services, Inc. (STS), the company's 1-year-old technology arm. STS both supports and drives company consolidation and integration efforts using a simple, back-to-basics approach: "Provide the best possible service at the lowest price."

Several steps taken during the last 18 months — including a major IS reorganization, data center consolidation, heavy network and electronic data interchange (EDI) spending and "insourcing" — have helped make Sears a sharper user of information technology. Already, these moves have helped the company keep pace with its fast-moving businesses and have rocketed Sears to the top of the retail industry ranking in the 1990 *Computerworld Premier 100.*

Analysts say that the savvy use of technology could be just the ticket needed to continue growth of the many diversifications undertaken by Sears during the 1980s. Hounded by hungry retailers such as J.C. Penney Co., Wal-Mart Stores, Inc., The Limited, Inc. and others, Sears expanded into financial services (Dean Witter Financial Services, Inc.), real estate (Coldwell Banker), credit (Discover card) and on-line services (Prodigy Services Co.), while expanding its Allstate Insurance Co. arm. The granddaddy of retailing also opened 779 smaller specialty shops, specializing in everything from eyeglasses to paint to computers.

While Sears is heavily computerized — it is said to be IBM's largest customer and owns the world's biggest Systems Network Architecture network — it has historically been unable to parlay the investment into any real strategic advantage, says Walter F. Loeb, a New York retail analyst and veteran Sears watcher.



David Joel

Sears' Carlson: IS *is helping Sears change the way it does business*

But recent downsizing and centralization have helped transform Sears into a more focused, effective user of information technology, Carlson says.

With profit up 3.8% to $1.5 billion in 1989, Sears is spending a whopping $950 million this year on information processing and networking, up 20% from the previous year. Much of that amount will go toward expanding and integrating Sears' vast network of some 250,000 personal computers and terminals.

"We've focused heavily on building a solid, total information processing network and architecture," Carlson explains. "We want this network to be seamless."

Neither is Sears afraid to rattle the glass house. In January 1989, top management dissolved divisional IS operations and formed STS, the centralized IS unit. Headed by Carlson, STS handles IS and communications for all of Sears except Allstate, which receives only network support.

Carlson explains that "the goal was to free up the business units so that they could concentrate on business applications and not worry about *where* they were going to run and *how* they were going to run." Divisions now do their own applications development; STS gives consulting, procurement and implementation help as needed.

What makes Sears IS so effective?

- **Insourcing centralizes IS; business units handle application development.**
- **Consolidated data centers save millions.**
- **Strong corporate commitment to IS, as shown by $950 million budget.**
- **Aggressive EDI program requiring its 5,000 suppliers to participate.**

Another facet if the new IS strategy is what Sears calls insourcing. The centralized group, Carlson says, is an information utility. Users are charged for networking, processing and consulting services.

Retailing

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Sears, Roebuck and Co.** Chicago, IL 444,400	12	27,390	$1,509	$990	332,350
2	**Carter Hawley Hale Stores, Inc.*** Anaheim, CA 37,000	87	24,725	$14	$42	13,394
3	**J. C. Penney Co.** Dallas, TX 198,000	95	24,435	$802	$201	89,000
4	**The Vons Companies** El Monte, CA 35,000	138	23,645	($10)	$46	5,500
5	**Melville Corp.** Harrison, NY 97,000	268	21,815	$679	$111	4,400
6	**The Limited, Inc.** * Columbus, OH 63,000	273	21,785	$347	$43	4,011
7	**Food Lion, Inc.*** Salisbury, NC 40,736	282	21,665	$140	$40	3,868
8	**Price Co.*** San Diego, CA 12,545	295	21,455	$117	$43	782
9	**Toys R Us, Inc.*** Rochelle Park, NJ 38,039	301	21,375	$321	$42	3,818
10	**Walgreen Co.*** Deerfield, IL 50,000	346	20,785	$154	$52	6,089
Medians for industry Top 10		**271**	**21,800**	**$238**	**$45**	**4,950**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

In another move aimed at cutting costs and centralizing power, Sears condensed its 10 scattered data centers into three "supercenters" located in Dallas; Columbus, Ohio; and Schaumburg, Ill. Carlson says the 16-month project, which was completed this spring, has already saved "millions" in operating costs and salaries.

Yet despite the cutbacks, Sears hasn't ignored new technology. The company is currently using or testing several advanced technologies, including radio frequency terminals in its service vans, expert systems, compact disc/read-only memory, IBM's Officevision, imaging in its catalog operations and video conferencing at nearly 800 sites, according to Dirk Van Alystyne, a Sears senior communications specialist and IS strategist.

Moreover, Sears is pursuing EDI in what Carlson describes as "a very big way." Early this year, Sears announced that its 5,000 suppliers would be required to transact business exclusively via EDI. All of its suppliers will be using EDI by 1992, he says.

To encourage use by small vendors, Sears provides a free EDI software package, free training and discounted IBM Personal System/1 computers. Suppliers can get started for as little as $1,000. So far, about 1,000 suppliers are using some form of EDI.

These new technology initiatives appear to be paying off. User chargeback costs have dropped during the last two years, Carlson says. Effective computerization has trimmed per-transaction costs for the Discover card to 5 cents below the industry average, he says. Annual handling expenses are $10 per account less than those of competitors, he adds.

Analysts say that it's too early to tell if technology will propel Sears into the 21st century. But the potential for new products and services is huge, says Edward A. Weller, a retail analyst at Montgomery Securities in San Francisco. With Sears' massive network and customer files, "the cross-indexing possibilities are endless," he says.

The company has also hired Harvard Business School guru Michael Porter to examine its IS operations and is considering an advanced point-of-sale system. ☐

MAGLITTA IS A
COMPUTERWORLD SENIOR
EDITOR, FEATURES.

Key to D&B: Mastering Information Volume

Dun & Bradstreet boosts sales with investment in IS

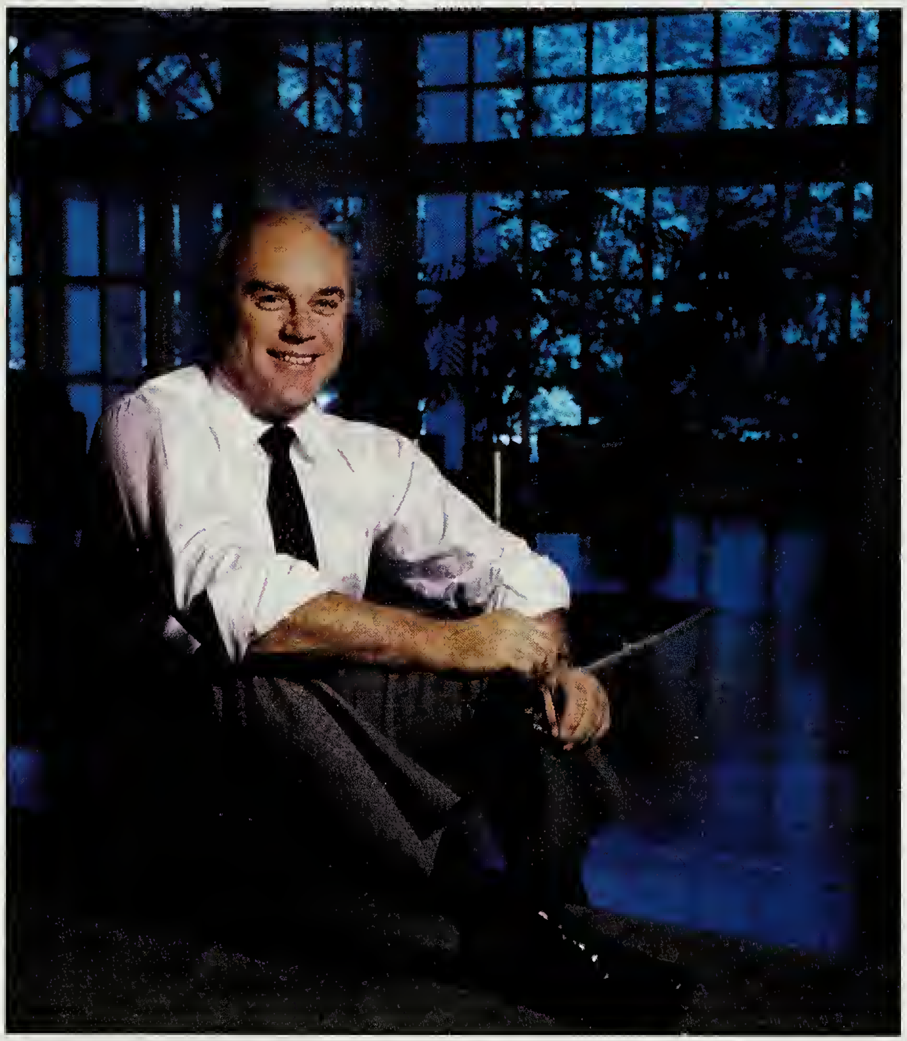
BY JIM NASH

Few companies deal with the quantity or range of data mastered by The Dun & Bradstreet Corp.'s information systems staff. In fact, at D&B, the database *is* the business. To this end, the firm maintains files containing hundreds of data elements on about 10 million to 12 million U.S. companies. Every day, approximately 100,000 file inquiries from customer service representatives and clients are logged.

The information D&B must track "is far bigger than any relational database constructed today," says Michael Field, president of the diversified service company's Business Information Group.

For this reason, the company requires a commensurately large IS investment: $750 million (about 17%) of $4.3 billion in 1990 sales. This investment was swelled in 1990 by the acquisition of Management Science America, Inc. in Atlanta, one of the largest general-ledger software vendors.

However, management is willing to spend the money to fuel continued growth and little wonder: In 1989, D&B profits jumped 17.5% to $56.4 million. The combination of effective investment in IS and solid business performance helped rank D&B at the top of its industry group and No. 11 overall in the 1990 *Computerworld Premier 100.*



Reinhold Spiegler

Dun & Bradstreet's Field: *Switching to low-cost PC platforms*

The company segments its operations six ways: risk management, directory, marketing and financial information services as well as business services and its in-house Corporate Resource Group.

Each D&B division depends on large amounts of business and comsumer data. Donnelley Directory compiles and publishes Yellow Pages directories. D&B Business Credit Services provides credit reports on more than 9 million businesses. Moody's Investors Service, Inc. rates corporate and government bonds. Nielsen Marketing Research measures point-of-sale success and television advertising's audience.

With all the services, D&B seeks to tame the overwhelming wave of spending data that its technology can now collect. Businesses have a twofold use for D&B's data: They turn to it when trying to buy or sell products from other firms — or the firms themselves. They also use it to better understand consumers and sell to them. With Moody's Investors Service, for example, consumers can better understand companies, at least for investment purposes.

As providing information services using database technology moves closer to becoming a commodity market, D&B faces new challenges to its leadership

Continued on page 51

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Goal Systems

Continued from page 49

position. To increase product development and customer use of its information services, D&B is in the midst of a multiyear effort to make its files available on lower-cost, more accessible personal computer platforms. Accomplishing this task to satisfy 70,000 employees and millions of customers is, to say the least, a difficult undertaking.

As the man charged with this megamission, Field — who is also corporate vice-president of consumer IS — has been working to remove mainframes from mainstream tasks, reserving them for roles as large database servers. This goes for both sides of D&B's house: the traditional business-to-business information side and the newer consumer-oriented side. After six years of playing the downsizing theme, Field is only now hearing the chorus sing along. That chorus is composed of managers in 26 decentralized divisions, each of which is autonomous.

Field's efforts are helping provide the platforms for D&B's latest products. Industry sources point to People Meter, the new data collection system used by D&B subsidiary Nielsen Marketing (formerly A.C. Nielsen). People Meter uses a wireless television remote control to replace the diaries previously used by volunteer TV watchers to record viewing habits.

On one hand, People Meter records viewing habits more faithfully. Viewers who watched "Three's Company" but logged a public-television documentary largely lost the fudge factor. On the other hand, recalcitrant subjects and technophobes skewed results by not using the device or by keying incorrect data. The resulting information seemed to indicate that fewer people were watching television.

The problems with the way the results were achieved and the fact that the findings were "contrary to what [advertising] companies wanted to hear," one analyst says, cost D&B a chunk of its reputation as an accurate data gatherer.

Undaunted by such criticism, D&B is working on a new product, says independent marketing and sales information consultant Bill Purcell in Palos Verdes, Calif. The new product works passively, using image recognition to record who is watching which program, Purcell says.

What makes D&B IS so effective?

- **Pioneer in information services market.**
- **Long-term commitment to accessible information technology.**
- **Proven ability to learn from mistakes.**
- **Close link between technology and the business.**

Critics and fans agree, however, that D&B does not wait for mistakes to improve on its products. Several analysts cited products under development at Nielsen Marketing that offer virtually up-to-the-minute sales figures at grocery and drug stores nationwide.

One such product, called Store*Link, would connect the ubiquitous laser scanners at store checkout counters to data collection systems, says John Costello, president of Nielsen. Corporate mainframes would collate the data into profiles prepared by D&B's customers.

"Store*Link could be a dramatic improvement in scanning technology," Purcell says. "All scanner data in general has acted as an abacus, counting one more can of Coke sold."

Programs such as Store*Link exhibit the technological goals Field is striving to achieve. They use an integrated database sporting an easy-to-use interface and offer personalized client services. "They show the level of investment [that companies] are willing to make," Purcell says. ☐

NASH IS A COMPUTERWORLD WEST COAST BUREAU CORRESPONDENT.

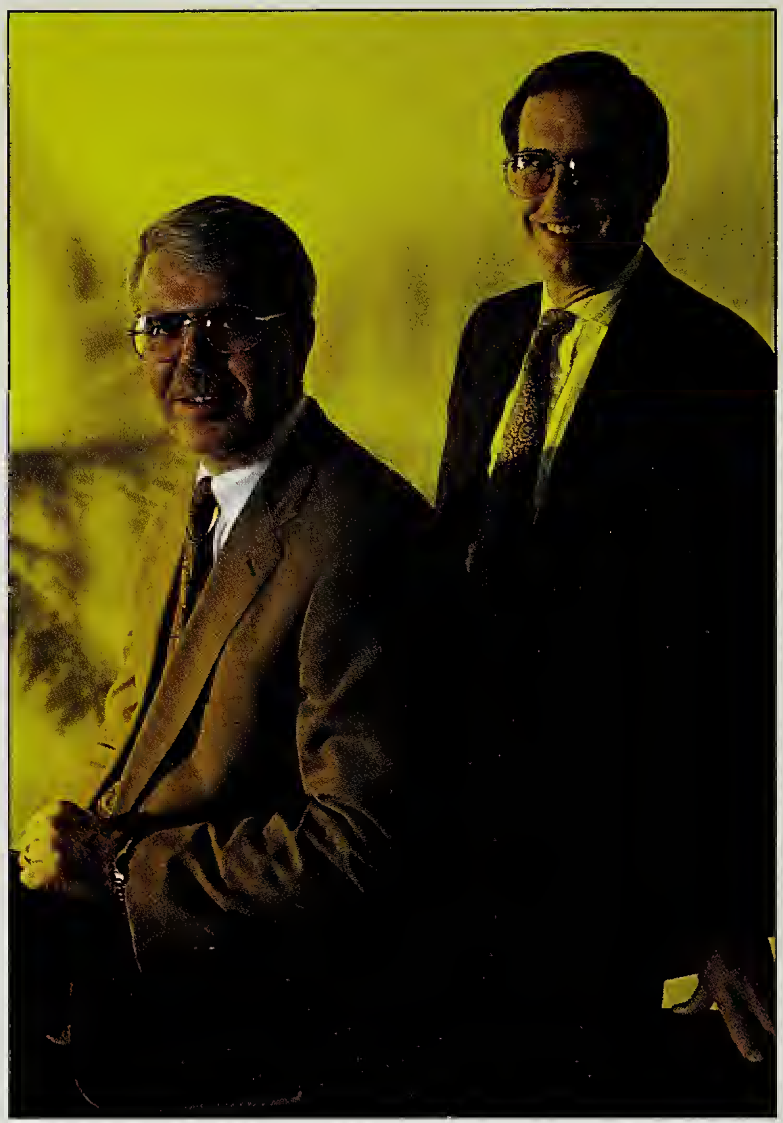
Diversified Services

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**The Dun & Bradstreet Corp.** New York, NY 70,000	11	27,465	$586	$750	50,000
2	**The Hertz Corp.** Park Ridge, NJ 30,000	116	23,940	$108	$94	8,300
3	**Dow Jones & Co.** New York, NY 9,818	118	23,925	$317	$17	7,540
4	**Paramount Communications, Inc.*** New York, NY 11,800	156	23,390	$1,465	$64	5,379
5	**Alco Standard Corp.*** Wayne, PA 17,700	157	23,385	$171	$92	3,673
6	**ARA Group, Inc.*** Philadelphia, PA 125,000	200	22,755	$39	$93	2,815
7	**CBS, Inc.** New York, NY 7,000	203	22,735	$150	$36	2,500
8	**American Financial Corp.*** Cincinnati, OH 53,000	211	22,630	$3	$146	5,657
9	**Capital Cities/ABC, Inc.*** New York, NY 19,860	222	22,525	$486	$63	6,421
10	**Humana, Inc.*** Louisville, KY 55,100	226	22,450	$256	$72	8,941
Medians for industry Top 10		**179**	**23,070**	**$214**	**$82**	**6,039**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

Gillette Information Systems Stays Close to the Business

BY JOANNE KELLEHER



Seth Resnick

Gillette's Moller *(left) and Standish re-examine basic assumptions*

Gillette Co., having survived to the venerable age of 89, has learned that sometimes it *does* make sense to reinvent the wheel.

The most visible new wheel the firm has created lately is the hot-selling Sensor razor, which the investment firm Morgan Stanley Group, Inc. estimates will account for $210 million in sales of razors and blades by the end of 1990. Introduced simultaneously in 19 countries across North America and Europe last January, Sensor embodies many of the business objectives that drive Gillette and its information systems organization.

The silver and black razor is based on a spring-mounted design unique in the annals of beard-removal technology. Ten designers collaborated on the project, using Prime Computer, Inc.'s Calma three-dimensional computer-aided design software running on Digital Equipment Corp. VAX 11/785-connected workstations.

Although the razor was in development for years, a marketing decision regarding the look of the product turned the last 18 months before introduction into an intricately choreographed race against the clock. While the product design team pushed for a more attractive and higher tech look for the product, 50 other designers monitored their progress and translated the new specifications into new factory machines.

Gillette took on a major manufacturing challenge with the Sensor, its first razor introduction in 10 years. Because almost all of the 230 component parts and processes were different from those used by any of the company's other razor products, a completely new production line had to be devised, virtually in parallel with the evolution of the design.

The need for fast turnaround and design flexibility was particularly dramatic with the Sensor introduction but, according to Herbert Moller, corporate vice-president and director of IS, these requirements are becoming much more pronounced in all phases of business.

For that reason, he says, the overriding priority for IS throughout the organization is to synchronize its pace with the accelerating tempo of business.

"The thrust of a lot of our activities," Moller says, "is to help compress planning cycles. That means designing applications in such an elegant way that you are able to change what you did yesterday with relative ease."

There is no template for the kind of

applications that Moller is talking about. As Ted Standish, director of IS for the Gillette North Atlantic Group observes, "We used to design applications by going to the person doing a job and asking him how he did it. That doesn't work anymore because the way a job has been done in the past may not be the way we want it done in the future. Basically, we've stopped hard coding organizational assumptions into programs."

Re-examination of basic assumptions has been an almost continuous process at Gillette ever since its major restructuring 2½ years ago. One of the results of that restructuring was the creation of the North Atlantic Group to treat the U.S., Canada and Europe as a single market for shaving and personal care products. Translating that idea of market unity into operational cohesion has meant subjecting the data definitions and data-producing systems in use across the two continents to close and ongoing scrutiny.

"If you are going to treat these areas as an integrated market," Standish says, "then clearly you need to get common information. The critical part of the process is determining how difficult it is to get common information using existing systems. The answer to that is the key to deciding where standardization is necessary."

Gillette's European IS groups decided to standardize on IBM's System/38 as a common hardware platform in 1984. Since then, the seven major European centers have moved steadily in the direction of full software and administrative compatibility — a goal that Derek Munson, MIS manager at Gillette in Europe, recently estimated will be reached in 1992.

With European operations well on their way toward smooth exchange of management information, Standish says, the next step is to figure out where and how to merge information flow throughout the entire North Atlantic region.

Top priorities include figuring out how to make information on finished-goods inventories in Europe and North America available in combined form on a daily basis and devising a means of retrieving sales information for the top accounts across geographic boundaries.

One vehicle for advancing this type of informational coordination is a professional advisory board, which was created this year. The board, Moller explains, consists of IS managers from the various business units as well as a number of key staffers from the corporate IS group. The board's purpose is to help maintain the delicate balance between functional decentralization of IS and the need for coordinated information handling.

The corporate IS group headed by Moller operates a central data center providing processing and programming services to the shaving and personal care and stationery products businesses. It also has responsibility for policy decisions about IS infrastructure and technology standards across the company. Rather than trying to make such decisions by fiat, however, Moller has chosen to operate in more of a participatory mode, soliciting suggestions from the board on matters such as the selection of new technology areas for investigation. ☐

What makes Gillette IS so effective?

- **IS keeps pace with fast business.**
- **Technological integration of North American and European markets.**
- **Professional advisory board coordinates decentralization.**

Kelleher Is A Computerworld Features Editor.

Consumer Products

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Gillette Co.*** Boston, MA 30,000	13	27,375	$285	$112	8,500
2	**Polaroid Corp.** Cambridge, MA 11,000	42	26,015	$145	$62	5,000
3	**McGraw-Hill, Inc.*** New York, NY 14,461	72	25,135	$48	$132	6,824
4	**Colgate-Palmolive Co.*** New York, NY 24,100	88	24,715	$280	$77	5,950
5	**Jostens, Inc.*** Minneapolis, MN 8,264	100	24,365	$54	$16	1,852
6	**Eastman Kodak Co.*** Rochester, NY 137,750	169	23,135	$529	$282	40,914
7	**Knight-Ridder, Inc.*** Miami, FL 21,000	175	23,095	$247	$39	8,291
8	**Avon Products, Inc.*** New York, NY 34,500	192	22,865	$55	$36	5,909
9	**Harcourt Brace Jovanovich, Inc.*** Orlando, FL 15,000	220	22,545	$72	$35	1,800
10	**Unilever U.S., Inc.*** New York, NY 30,567	223	22,495	$139	$22	8,562
Medians for industry Top 10		**135**	**23,750**	**$142**	**$51**	**6,387**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

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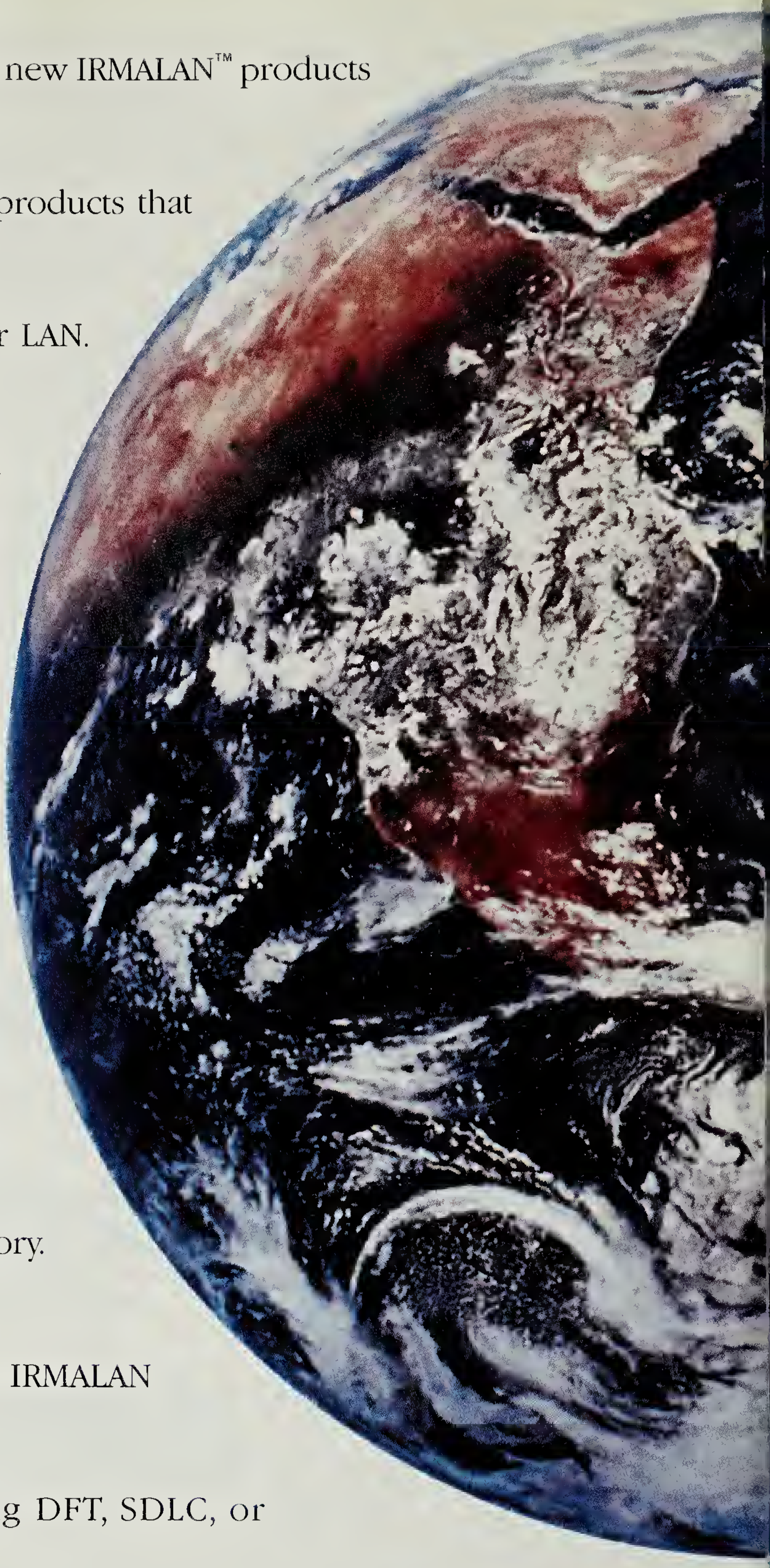

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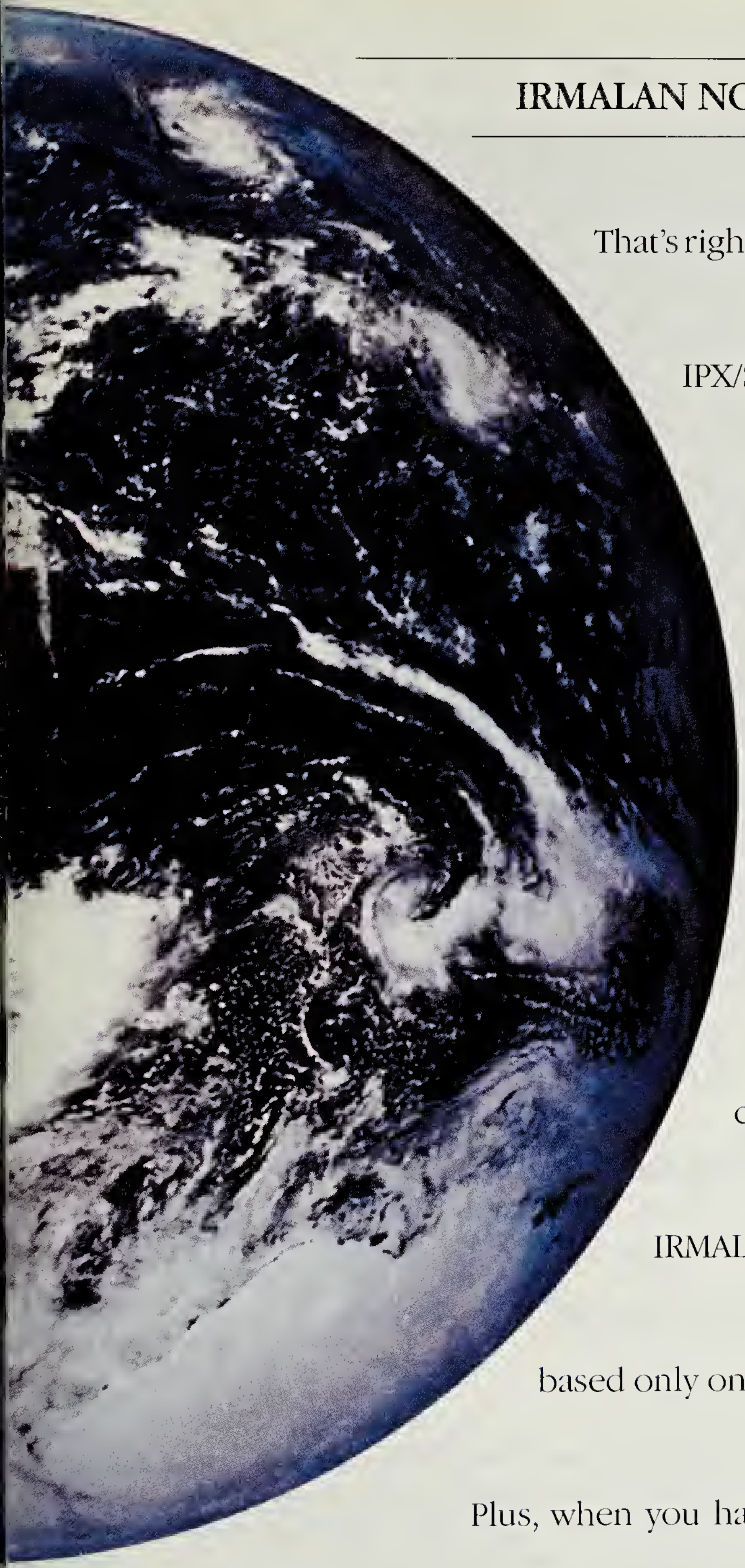

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3M's Kuhrmeyer: *We do strategic planning throughout the company*

Alvis Upitis

Sticking With Innovation

3M uses systems to adapt to changing customer needs

BY ALAN J. RYAN

AND MICHAEL SULLIVAN-TRAINOR

The only sticky situations tolerated at 3M Co. are those involving consumers using Scotch Tape or Post-it Notes or workers adhering to the company's policy of innovation.

Thanks to the strategic use of information systems at the Minnesota Mining & Manufacturing Corp., troublesome situations with customers are rare. For example, when ordering any of its more than 60,000 diverse products — such as software diskettes, Bufpuf skin care products, tape products, paint stripper, Scotchgard fabric protector, sandpaper, medical diagnostic equipment and masking tape — from any division worldwide, the customer is always identified by the same ID number. It makes life easier for the customer and for 3M.

Computerized IDs are just one way in which 3M is using systems to help meet its business needs and one reason why 3M has been named to the *Computerworld Premier 100* list as the most effective user of information systems in manufacturing.

"One of the key tenets to 3M's success is its ability to adapt to meet new and different customer needs," says Theresa M. Gusman, an analyst at Salomon Brothers, Inc. With a presence in more than 50 countries worldwide, 3M is doing just fine, she says.

Sales for the St. Paul, Minn.-based manufacturing giant were $126 billion last year, and earnings amounted to just over 10% of that figure. Projected 1990 earnings for the corporation, which got its start as a mining company, are $13.4 billion. Last year, 3M passed the $1 billion mark in export sales, according to published reports.

"They tend to hold leadership positions in their markets, and in most cases, they dominate the markets," Gusman says. Much of that success is because they keep on top of the needs of the ultimate customer — the consumer.

The primary reason 3M's IS operation is effective is because of its strong adherence to standards and its ability to anticipate the requirements of the innovative corporate culture. This is not an easy task in a company that pumps out, on the average, 200 new products annually.

"All through the company we do strategic planning,"

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says Carl A. Kuhrmeyer, vice-president of administration and the company's highest ranking IS official. "The company expects each unit to innovate and come up with new ideas," he says.

That's where IS fits in. "We provide the infrastructure. We facilitate the business units' abilities to carry out their ideas," Kuhrmeyer says. "An operating division may not realize it needs a global database today," he adds, "but they may need one two years from today because of new products they are planning. We start developing that now and anticipate their needs."

3M is organized along product lines into 60 different business units. IS support for these units ranges from a large central organization, which reports to Kuhrmeyer, to IS groups and individuals that report to the business unit executives. All told, the company has 87,000 employees, 2,700 of whom work in IS.

'We work very closely with the operating groups so that we know what's coming," Kuhrmeyer says.

Operating under Kuhrmeyer is Donald H. Siegfried, staff vice-president of IS and data processing. Siegfried's group, based in St. Paul, tells 3M buyers of systems from all around the country that the preferred vendors include IBM, Digital Equipment Corp. and Hewlett-Packard Co.

However, divisions and user departments — there are 175 3M factories in the U.S. alone — are free to make their own choices if they feel there is a real need to go with a nonpreferred vendor or product. The company encourages that kind of innovation.

For instance, Unix had been in use on some manufacturing floors for 18 months before it got support from the central IS operation. The manufacturing people wanted the systems and put them in.

In fact, IS operates much like the rest of the company with respect to innovation — new ideas will be encouraged and implemented no matter where they originate. "It's a way of life," Kuhrmeyer says.

For example, if a division develops a new application or process, the central group will adopt it without having to take it over, he adds. However, there is also a strong emphasis on standards within a single product line. "A plant in Germany will use comparable systems to one in the U.S. to ensure the same quality, cost and delivery," Kuhrmeyer says.

What makes 3M Corp. IS so effective?

- **Fanatical dedication to innovation and flexibility**
- **Adherence to IS standards to ensure consistent product quality**
- **Emphasis on strategic planning to anticipate future needs**
- **Longevity of top management**

Siegfried, who has been at 3M for nearly 40 years and is one of many long-term employees, is working with a 1990 IS budget of $469 million. An additional $100 million will be spent on end-user activities other than personal computers and telephone equipment, according to Darril Wegscheid, manager of IS and data processing information planning. Of that money, nearly half will be spent on personnel, including salary, benefits, travel and training costs.

Longevity in the management ranks — all of the top managers have been with the company for 25 years or more — helps 3M carry out its ambitious agenda, says Kuhrmeyer, who has been with the company for 39 years. "We can do some of the things we do," he says, "because we trust each other completely." ☐

RYAN IS COMPUTERWORLD'S SENIOR WRITER, FEATURES.

Manufacturing

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**3M Co.** St. Paul, MN 86,600	30	26,540	$1,310	$469	42,200
2	**The Mead Corp.*** Dayton, OH 21,800	48	25,725	$216	$53	18,273
3	**Baxter International, Inc.** Deerfield, IL 60,000	50	25,645	$446	$200	25,000
4	**TRW, Inc.*** Cleveland, OH 74,300	64	25,315	$263	$85	40,607
5	**Amax, Inc.** New York, NY 20,000	73	25,055	$360	$30	10,000
6	**The Penn Central Corp.*** Cincinnati, OH 15,100	75	25,035	$174	$15	6,538
7	**Becton, Dickinson & Co.** Franklin Lakes, NJ 18,800	83	24,785	$169	$46	7,381
8	**Xerox Corp.** Stamford, CT 99,000	85	24,740	$704	$400	43,000
9	**Aluminum Co. of America*** Pittsburgh, PA 60,660	89	24,705	$945	$104	16,617
10	**Inland Steel Industries, Inc.** Chicago, IL 20,000	91	24,655	$241	$70	5,400
Medians for industry Top 10		**74**	**25,045**	**$312**	**$78**	**17,445**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

IS Helps ‘Cat’ Stay on its Feet

BY MICHAEL FITZGERALD

Heavy industry giant uses systems to keep its balance during tough times

In a decade that was tough on heavy industry, Caterpillar, Inc., known by many simply as Cat, held its position as the world’s top maker of heavy equipment. The $11.1 billion company is No. 1 or No. 2 in each of its dozen or so markets, ranging from tractors to front-end loaders, pipe-layers and various engines. And the company has actually gained market share in its major lines of business.

With information systems playing a strong role in that kind of success record, it’s no surprise that the Peoria, Ill., company ranks No. 1 in the *Computerworld Premier 100* industrial class and is one of only four industrials in the overall ranking.

Caterpillar’s IS strategy is vital to maintaining its leadership position. “We make sure that the company always has a competitive advantage from the use and flow of information,” says Dale Fieldcamp, director of computer IS at Caterpillar.

Fieldcamp, 62, has worked at Caterpillar for 40 years in departments ranging from parts distribution to finance and accounting. He has worked in IS for the past 10 years, six years as director. His broad background in the business helps give users “a feeling of confidence” that their interests are being served by IS.

His philosophy? “The users should always feel that it’s their project, their objectives and their goals, and it’s not an ‘IS project,’ ” Fieldcamp says.

That approach squares with what Fieldcamp sees as a fundamental shift over the last few years in systems projects in general. “The process is now geared more toward the total business, where before it was geared more toward the task at hand,” he says.

Fieldcamp credits Caterpillar’s top executives with helping spread technology throughout the organization. “Management recognizes the importance of information technology. That’s been a major factor in our success.”

In this case, crediting management is more than simply good politics, Wall Street analysts say. Caterpillar goes into a project having done “much deeper soul-searching” than its competitors, says Karen Ubelhart, a first vice-president at Shearson Lehman Hutton, Inc.

Take, for example, the company’s $2.3 billion, 5-year-old “Plant With A Future” project designed to revamp the 32 facilities that Caterpillar operates worldwide by 1992. “Companies are always upgrading their factory floors,” Ubelhart says, “but Cat just sat down with a clean sheet of paper and, instead of doing an evolutionary change, is making a major change in the way they make their products.”

Caterpillar is one of the most vertically integrated companies in the industry, which “puts a greater demand on [information] systems,” says Tobias Levkovich, capital goods/machinery analyst at Smith Barney, Harris Upham & Co. One result, he says, is that “you’ve got to control your entire manufacturing process from steel producing to the end of the assembly line.”

This puts added pressure on IS, which has to be involved in the new design criteria for equipment as well as design of the manufacturing floor.

The extreme vertical integration makes Caterpil-

Continued on page 60

Caterpillar, Inc.

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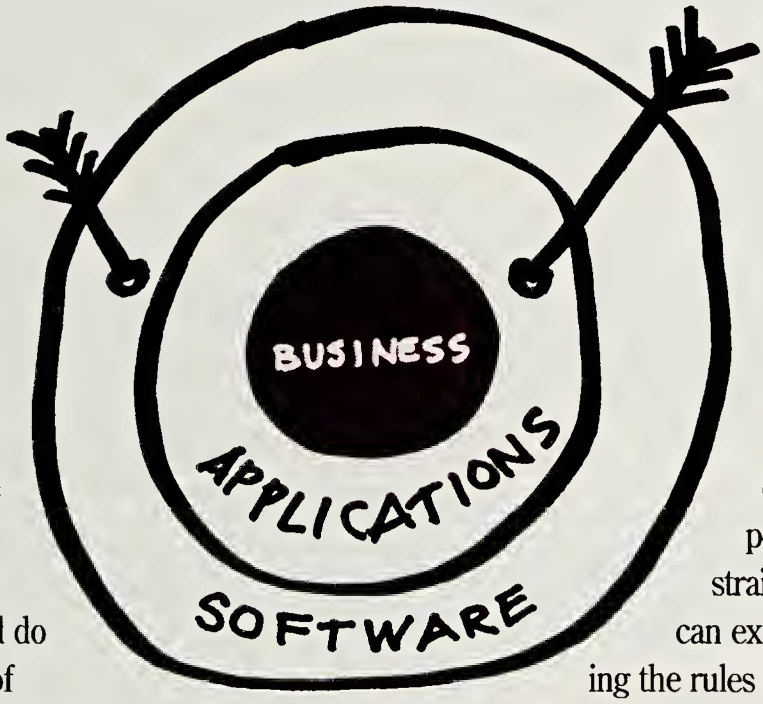

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Continued from page 58

lar a highly capital-intensive company, which means the huge investment in the Plant With A Future project is a genuine commitment to complete change.

"Caterpillar has been extremely centralized, which was a way of managing the demand that they have," says Jennifer Cole, industrial goods analyst at A.G. Edwards and Sons, Inc. Cole says she approves of Caterpillar's extensive and ongoing reorganization.

"I think they're doing the right things with the Plant With A Future program and the reorganization of the management structure," she says. "They have reorganized the manufacturing from centralized to decentralized functions. Each area will be profit centers, whereas each individual division didn't have a good sense of where money was coming from before."

What makes Caterpillar IS so effective?

- **$2.3 billion plant of the future project.**
- **Vision of seamless worldwide network.**
- **Emphasis on technological change.**
- **Extensive use of advanced telecommunications.**

Fieldcamp also sees it as another management challenge for IS:

"They're setting up profit centers; we have to get them all the information they need to run their businesses in a new way. We have to be sure we're developing those and making it available to them."

Industrial

Industry rank	**Company** Location Totol employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Caterpillar, Inc.** Peorio, IL 60,409	35	26,405	$497	$300	25,000
2	**The Timken Co.*** Conton, OH 17,248	43	25,910	$55	$37	5,110
3	**The Pittston Co.*** Greenwich, CT 14,500	60	25,470	$4	$66	4,914
4	**Ingersoll-Rand Co.** Woodcliff Loke, NJ 31,623	61	25,400	$210	$80	18,000
5	**Dresser Industries, Inc.*** Dollos, TX 31,400	104	24,295	$170	$106	9,420
6	**Harnischfeger Industries, Inc.*** Milwoukee, WI 12,000	135	23,675	$71	$20	3,538
7	**Masco Industries, Inc.*** Toylor, MI 14,300	170	23,135	$57	$35	1,981
8	**Trinity Industries, Inc.*** Dollas, TX 9,560	194	22,835	$30	$13	362
9	**Paccar, Inc.*** Bellevue, WA 13,077	201	22,740	$242	$50	3,769
10	**Parker Hannifin Corp.** Cleveland, OH 31,000	212	22,620	$124	$49	8,600
Medians for industry Top 10		**120**	**23,985**	**$98**	**$50**	**5,012**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

Fieldcamp says this extreme vertical integration, plus the effort to decentralize, pulls the IS department in different directions.

"We try to minimize the centralization and to keep it as distributed as is practical. But in a highly integrated operation like ours, we have to recognize that some core corporate items must be centralized," he says.

Thirteen of Caterpillar's 17 divisions are "profit centers" that sell directly to the public. The other four are internal service divisions. Fieldcamp's group is part of the Corporate Services Division, headed up by Vice-President Charles E. Rager. Other branches within the division include marketing support services and computer-integrated manufacturing. The company now has about 300 product lines (services not included), as opposed to approximately 150 lines a decade ago.

Caterpillar has plants in 10 countries, 217 dealers worldwide and 22 distribution sites in 10 countries. Systems in use range from Unix-based workstations in engineering to IBM machines on the corporate side and Digital Equipment Corp. systems on the shop floors.

With design engineers in Illinois, Japan, Belgium and Brazil working on the same products, for instance, Fieldcamp must find ways to allow these engineers to work together.

One way is through heavy emphasis on advanced telecommunications. Caterpillar bought a satellite four years ago with the goal of allowing its engineers to work on the same image simultaneously and see their colleagues' changes as they are made.

Fieldcamp estimates that this kind of seamless image sending is probably another three or four years away. In the meantime, the satellite has enabled Caterpillar to get service and marketing information to its dealers faster than ever before.

"We sell products throughout the world, and you need a communications network that will reach dealers regardless of how remote they are, and reach them in a timely fashion so they're up to date on equipment and how to service the equipment," Fieldcamp says.

It's all part of keeping Caterpillar moving. As Fieldcamp says, "business needs drive the use of technology." And at Cat, that means a big payload. ☐

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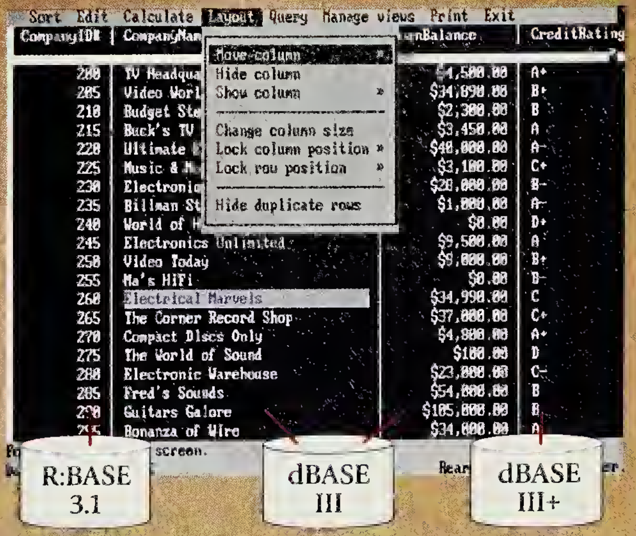

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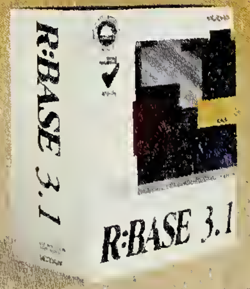

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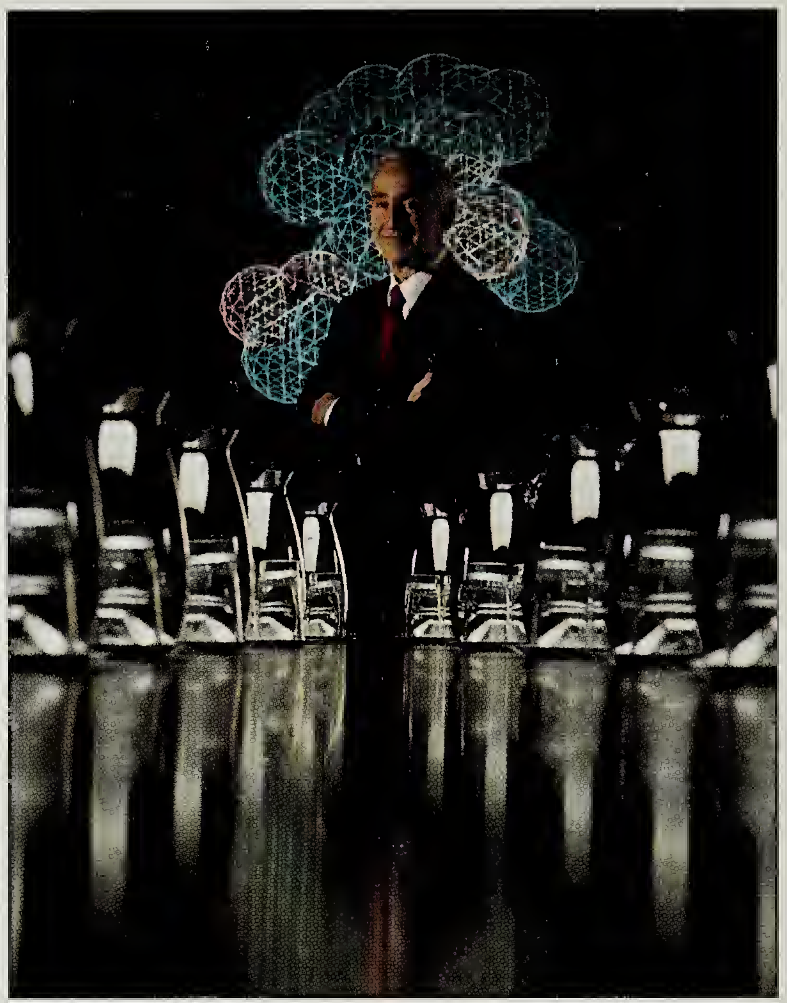
Tight Lips, Laptops and Supers Help Merck Shine

BY GLENN RIFKIN



Louis Psihoyos/Matrix

CEO Vagelos *heads up Merck's management council*

Information systems excellence might be one of the best-kept secrets about Merck & Co., a potent force in the tight-lipped drug industry and arguably the most highly regarded corporation in the U.S.

In 1986, Merck passed none other than IBM to finish atop *Fortune*'s list of America's most admired corporations and has held that spot ever since. It now adds another honor: most effective user of IS in the pharmaceuticals market.

You'd hardly know it. Albert Cinorre, Merck's vice-president of computer resources, refuses to discuss Merck's IS operations and has instructed his staff to do the same.

Although he won't talk to the press, Cinorre did acknowledge in an internal company publication that Merck considers itself a technology leader in the industry. In fact, without Merck's major commitment to computing, Cinorre added, "we'd probably be out of business."

Cinorre oversees an IS budget of $185 million and a staff of 1,000 IS professionals in Merck facilities around the world. According to information provided by Merck, the company has 11,000 personal computers and terminals and spends 50% of its IS budget on personnel costs such as salaries, training, benefits and travel.

The company, formerly a major Wang Laboratories, Inc. shop, has turned to IBM during the past three years. Most of its $110 million worth of equipment is from IBM, and according to a Merck spokeswoman, the new corporate headquarters in White House Station, N.J., will use state-of-the-art IBM systems. Merck plans to move in 1992.

The pharmaceuticals industry is intensely competitive and is thus secretive about product development. A successful new drug introduction is the result of years of exhaustive research, clinical trials, government approvals and marketing plans. Mevacor, for example, a critical cholesterol-reducing drug, took Merck 10 years to develop. Being first to market can mean hundreds of millions of dollars in revenue to a company. So it's little surprise that sharing tips on how to get that edge is verboten.

Merck also gets to market better than anyone else. According to *Fortune,* Merck has introduced a remarkable 10 major drugs since 1981, each accounting for at least $100 million in sales annually.

Computers play a critical role in drug development, particularly in the areas of molecular modeling and crystallography. Merck recently installed a high-end IBM 3090 with supercomputer speed in its Merck, Sharp & Dohme Research Lab.

Merck scientists were finding it difficult to get computer time on the old system to model and analyze results of design and testing. The new system allows Merck scientists to run programs in seconds that once took 30 minutes or longer on older workstations.

Merck hopes the new system will make possible such research projects as designing molecules to adhere to receptors or binding sites in the body. Finding these molecules often means testing hundreds of compounds, using computer simulation to find the one that fits. Once the molecules are found, chemists can theoretically synthesize them and find new ways to combat cancer and other diseases.

Merck, Sharp & Dohme's sales force — the largest in the Merck empire — pioneered the use of portable PCs back in the mid-1980s and is now spreading laptop technology even further. By the end of 1991, all 2,700 sales representatives will be using laptops on customer calls.

By giving its 100 hospital sales representatives computers five years ago, Merck earned a reputation as a technology-driven company, and that image has spread. The company says PCs allow sales representatives to make on-the-spot projections and analyses that would previously have taken weeks. For example, a software program for Merck's injectible antibiotic Primaxin can make 24,000 comparisons of the microbiological spectrum of 28 antimicrobial agents so that physicians and prospective customers can see just how many diseases the drug can treat.

Merck is using laptops and conventional PCs in training and sales support across the entire corporation. Internally developed software programs are giving Merck a competitive advantage in every facet of sales, including plan routing, order tracking, customer profiles and internal communications.

For the past several years, Merck has been investing heavily in robotics and intelligent vision systems to improve its quality control and manufacturing processes.

Merck has its own advanced technology group, which is at work on developing a low-cost seeing machine. William Pater, senior director of IS management, oversees the group.

What makes Merck IS so effective?

- Strong investment in IS personnel.
- Savvy use of IBM 3090 for drug development.
- Widespread use of portable PCs for sales force.
- Exploration of advanced technologies, including robotics, intelligent vision.

The firm has also targeted expert systems and voice recognition as critical technologies for use in its research-intensive environment. It installed its first voice recognition system in 1987 at its Hybridoma lab in West Point, Pa.

Merck's IS group did pioneering work in creating the pharmaceutical industry's first computer-controlled processing facilities. The company implemented an MRP II system at its West Point facility as well.

Merck's business strategy is steered by a management council headed by President and Chief Executive Officer Roy Vagelos. The council, which meets monthly, is made up of 22 senior-level executives; each division is represented. Cinorre and his Computer Resources Group are part of a corporate division that oversees the activities of all other divisions. Cinorre himself reports to council member Stanley Fidelman, senior vice-president of engineering and technology. ☐

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Pharmaceuticals

Industry rank	Company Location Total employees	Overall rank	Total score	1989 profits (millions)	Estimated IS budget (millions)	Total PCs and terminals
1	**Merck & Co.** Rahway, NJ 34,000	38	26,310	$1,500	$185	11,000
2	**Abbott Laboratories** Abbott Park, IL 43,000	79	24,975	$860	$145	15,000
3	**Eli Lilly and Co.*** Indianapolis, IN 28,200	92	24,505	$940	$39	24,995
4	**Central Soya Co.** Ft. Wayne, IN 3,474	113	24,005	$15	$23	741
5	**Johnson & Johnson** New Brunswick, NJ 81,300	132	23,705	$1,082	$212	14,958
6	**Whitman Corp.** Chicago, IL 25,000	153	23,425	$372	$40	2,400
7	**Pfizer, Inc.** New York, NY 40,000	159	23,370	$681	$175	11,000
8	**Warner-Lambert Co.*** Morris Plains, NJ 33,000	167	23,190	$413	$41	6,488
9	**Schering-Plough Corp.*** Madison, NJ 21,300	188	22,915	$471	$38	5,162
10	**Coca-Cola Enterprises, Inc.*** Atlanta, GA 20,000	190	22,895	$1,724	$41	3,885
Medians for industry Top 10		**143**	**23,565**	**$771**	**$41**	**8,744**

Companies are ranked by industry according to CW 100 Index. *Estimates are from *Computerworld* sources, not the company.

THE PREMIER 100

COMPANY, RANK

Ambase Corp., **80**
AMR Corp., **4**
AT&T, **74**
Abbott Laboratories, **79**
Aetna Life & Casualty Co., **99**
Air Products & Chemicals, Inc., **25**
Allied-Signal, Inc., **24**
Aluminum Co. of America, **89**
Amax, Inc., **73**
American Express Co., **26**
Ameritech Applied Technologies, **23**
Atlantic Richfield Co., **31**
Banc One Corp., **9**
Bankamerica Corp., **40**
Bankers Trust New York Corp., **3**
Baxter International, Inc., **50**
Becton, Dickinson & Co., **83**
Bell Atlantic Corp., **22**
The Boeing Co., **49**
CSX Corp., **55**
Carter Hawley Hale Stores, Inc., **87**
Caterpillar, Inc., **35**
Centerior Energy Corp., **47**
Chicago & North Western Trans. **14**
Colgate-Palmolive Co., **88**
Contel Corp., **39**
Corestates Financial Corp., **19**
The Dow Chemical Co., **20**
Duke Power Co., **82**
The Dun & Bradstreet Corp., **11**
Eli Lilly and Co., **92**
Enron Corp., **96**
FMC Corp., **2**
Federal Express Corp., **28**
Freeport McMoran, Inc., **70**
GTE Corp., **21**
Gencorp, Inc., **10**
General Dynamics Corp., **6**
General RE Corp., **44**
Gillette Co., **13**
The B.F. Goodrich Co., **46**
Grumman Corp., **41**
Ingersoll-Rand Co., **61**
Inland Steel Industries, Inc., **91**
J.C. Penney Co., **95**
J.P. Morgan & Co., **76**
Jostens, Inc., **100**
Lockheed Corp., **77**
Louisiana Land & Exploration Co., **86**
MCI Communications Corp., **1**
Martin Marietta Corp., **16**
Massachussetts Mutual Life Ins., **53**
McDonnell Douglas Corp., **65**
McGraw-Hill, Inc., **72**
The Mead Corp., **48**
Merck & Co., **38**
Merrill Lynch & Co., **93**
Metropolitan Life Ins. Co., **63**
Mobil Corp., **68**
Monsanto Co., **37**
Mutual Benefit Life Ins. Co., **84**
The Mutual Life Ins. Co., **94**
National City Corp., **81**
New York Life Ins. Co., **54**
Northeast Utilities, **45**
Northrop Corp., **51**
Northwestern Mutual Life Ins., **98**
Norwest Corp., **8**
Oryx Energy Co., **32**
Pacific Mutual Life Ins. Co., **34**
Paine Webber, Inc., **7**
The Penn Central Corp., **75**
Phillips Petroleum Co., **33**
The Pittston Co., **60**
Polaroid Corp., **42**
Primerica Corp., **58**
The Prudential Ins. Co. of America, **57**
Quantum Chemical Corp., **67**
Rockwell International Corp., **69**
Rohm & Haas Co., **52**
Salomon, Inc., **36**
Sears, Roebuck and Co., **12**
Security Pacific Corp., **17**
Shawmut National Corp., **97**
Signet Banking Corp., **15**
Southwestern Bell Corp., **29**
Sun Co., **78**
TRW, Inc., **64**
Textron, Inc., **66**
The Timken Co., **43**
The Travelers Corp., **71**
3M Co., **30**
US West, **27**
Union Carbide Corp., **62**
Union Texas Petroleum Holdings **5**
United Technologies Corp., **59**
United Telecommunications, Inc., **18**
Valhi, Inc., **90**
Wells Fargo & Co., **56**
Xerox Corp., **85**

HOW TO EVALUATE YOUR COMPANY

Companies that wish to compare their use of information systems with the *Computerworld Premier 100* can request a worksheet to evaluate their ranking. During the past two years, companies have found the worksheet to be a useful measure of their industry standing.

Actual *Premier 100* rankings are based on a system that considers each firm's score in relation to the figures for all companies surveyed (see methodology page 17). For this reason, the worksheet calculations will not represent exact scores. However, ranges provided in the worksheet will allow companies to approximate their total scores.

To obtain a worksheet, contact Michael L. Sullivan-Trainor, Senior Editor, *Computerworld*, 375 Cochituate Road, Framingham, Mass. 01701. Telephone: (800) 343-6474 or (508) 879-0700, Ext. 229.

ACKNOWLEGEMENTS

We would like to thank the following people for providing assistance with the 1990 *Premier 100:* Focus Research; Susan Hancock, Hancock Consulting; Dr. Stephen Parkoff, Coopers & Lybrand; Marty Redden, Association Research; and Bob Tasker, IDC. Thanks also to those who helped develop our criteria: Tom Johnson, Nolan Norton & Co.; Tom Davenport, Index Group; and Mike Webber, Diebold Group.

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